



Final

10 February 2005

Second Five-Year Review of Record of Decision

Naval Magazine Indian Island

Port Hadlock, Washington

**Department of the Navy
Naval Facilities Engineering Command
Engineering Field Activity, Northwest**

19917 Seventh Avenue NE
Poulsbo, WA 98370-7570



EXECUTIVE SUMMARY

As lead agency for environmental cleanup of Naval Magazine (NAVMAG) Indian Island, the U.S. Navy has completed the second 5-year review of remedial actions, conducted pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). The purpose of this 5-year review is to ensure that the remedial actions selected in the Record of Decision (ROD) for NAVMAG Indian Island remain protective of human health and the environment. A 5-year review is required for this site because the remedies allow contaminants to remain in place at concentrations that do not allow unlimited site use and unrestricted exposure. This second 5-year review was prepared in accordance with *Navy/Marine Corps Policy for Conducting Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews* (U.S. Navy 2004a) and November 2001 [Revised May 2004], and the U.S. Environmental Protection Agency's *Comprehensive Five-Year Review Guidance* (USEPA 2001).

The remedies for Indian Island are protective of human health and the environment. This second 5-year review identified the following recommendations:

- Continue the institutional controls program activities for Site 10 (includes all activities related to shoreline stabilization and the landfill cap).
- Continue Site 10 groundwater monitoring at a frequency of twice per year, to continue to evaluate the stability of landfill conditions and ensure that chemicals of concern (COCs) are not being mobilized.
- Discontinue shellfish and sediment monitoring. The Site 10 shellfish and sediment monitoring requirements of the ROD have been met, the remedial action objectives have been met and, therefore, further shellfish and sediment monitoring at Site 10 is not required.
- Discontinue shellfish harvest restrictions, based on chemical concentrations (beach access restrictions remain in place for safety considerations, because of ordnance handling operations). When the explosives safety restriction is retracted from the Site 10 area, and there is a request to harvest the Site 10 beaches, the Navy will contact Washington's Department of Health regarding reopening the beaches for shellfish harvesting.
- Discontinue the institutional controls associated with Site 36 and amend the Institutional Controls Management Plan accordingly.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name (from WasteLAN): Port Hadlock Detachment

EPA ID (from WasteLAN): 110001855662

Region: 10 **State:** WA **City/County:** Indian Island/Jefferson County

SITE STATUS

NPL status: Final ☒ Deleted Other (specify) _____

Remediation status (choose all that apply): Under Construction Operating ☒ Complete ☒

Multiple OUs?* YES NO ☒ **Construction completion date:** 05/07/1997

Has site been put into reuse? YES NO ☒

REVIEW STATUS

Lead agency: EPA State Tribe Other Federal Agency: Navy

Author name: Larry Tucker

Author title: Remedial Project Manager

Author affiliation: Engineering Field Activity NW,
Navy

Review period:** 09/30/00 to 09/30/05

Date(s) of site inspection: 9/15/04

Type of review:

Post-SARA ☒ Pre-SARA NPL-Removal only
Non-NPL Remedial Action Site NPL State/Tribe-lead
Regional Discretion

Review number: 1 (first) 2 (second) 3 (third) Other (specify) _____

Triggering action:

Actual RA Onsite Construction at OU# _____
Construction Completion
Other (specify): _____

Actual RA Start at OU
Previous Five-Year Review Report

Triggering action date (from WasteLAN): September 2000

Due date (five years after triggering action date): 9/30/2005

*["OU" refers to operable unit.]

**[Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form (Cont.)

Issues:

None

Recommendations and Follow-Up Actions:

- Continue the institutional controls program activities for Site 10 (includes all activities related to shoreline stabilization and the landfill cap).
- Continue Site 10 groundwater monitoring at a frequency of twice per year, to continue to evaluate the stability of landfill conditions and ensure that chemicals of concern are not being mobilized.
- Discontinue shellfish and sediment monitoring. The Site 10 shellfish and sediment monitoring requirements of the Record of Decision (ROD) have been met, the remedial action objectives have been met and, therefore, further shellfish and sediment monitoring at Site 10 is not required.
- Discontinue shellfish harvest restrictions, based on chemical concentrations (beach access restrictions remain in place for safety considerations, because of ordnance handling operations). When the explosives safety restriction is retracted from the Site 10 area, and there is a request to harvest the Site 10 beaches, the Navy will contact Washington's Department of Health regarding reopening the beaches for shellfish harvesting.
- Discontinue the institutional controls associated with Site 36 and amend the Institutional Controls Management Plan accordingly.

Protectiveness Statement(s):

The remedies implemented for Indian Island are protective both in the short and long term.

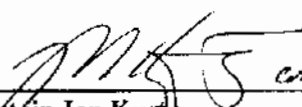
Other Comments:

Based on completion of remedial and removal activities at all sites at Naval Magazine Indian Island, including the post-ROD sites, the Navy submitted the Final Close Out Report for the base and has begun the process of delisting Naval Magazine Indian Island from the National Priorities List.

SECOND FIVE-YEAR REVIEW OF RECORD OF DECISION
Naval Magazine Indian Island
U.S. Navy, Engineering Field Activity, Northwest
Contract No. N44255-02-D-2008
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Signature sheet for the Naval Magazine Indian Island second five-year review of Record of Decision report.



Captain Jon Kurtz
Commanding Officer, Naval Magazine Indian Island
U.S. Navy

2-4-05

Date

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ABBREVIATIONS AND ACRONYMS

AET	apparent effects threshold
ARAR	applicable or relevant and appropriate requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BHC	benzene hexachloride
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	cleanup screening level
CSR	current situation report
DDD	dichlorodiphenyldichloroethane
DDT	dichlorodiphenyltrichloroethane
Ecology	Washington State Department of Ecology
EFA NW	Engineering Field Activity, Northwest
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Difference
FISC	Fleet and Industrial Supply Center
FS	feasibility study
g/day	grams per day
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
HWSA	Hazardous Waste Storage Area
IAS	initial assessment study
ICMP	Institutional Controls Management Plan
MCL	maximum contaminant level
MEC	munitions and explosives of concern
µg/L	microgram per liter
mg/kg	milligram per kilogram
MMP	Marine Monitoring Plan
msl	mean sea level
MTCA	Model Toxics Control Act
NAVMAG	Naval Magazine
Navy	U.S. Navy
NBK	Naval Base Kitsap
NCP	National Oil and Hazardous Substances Pollution Contingency Plan

ABBREVIATIONS AND ACRONYMS (Continued)

NFA	no further action
NPL	National Priorities List
NTCRA	non-time-critical removal action
O&M	operation and maintenance
OB/OD	open burning/open detonation
OM&M	operation, maintenance, and monitoring
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
RAB	Restoration Advisory Board
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RDX	research demolition explosive (cyclotrimethylene trinitramine)
redox	oxidation reduction
RG	remediation goal
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
SMS	Sediment Management Standard
SQS	Sediment Quality Standards
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbons
TRC	Technical Review Committee
UCL	upper confidence limit
VOC	volatile organic compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

This report presents the results of the second 5-year review performed for the Naval Magazine (NAVMAG) Indian Island National Priorities List (NPL) site. The purpose of 5-year reviews is to determine whether the remedies selected for implementation in the Record of Decision (ROD) for a site are protective of human health and the environment. The methods, findings, and conclusions of 5-year reviews are documented in 5-year review reports, which identify any issues found during the review and provide recommendations to address them.

The U.S. Navy (Navy), the lead agency for NAVMAG Indian Island, is preparing this 5-year review report pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP; 40 Code of Federal Regulations [CFR] Part 300). CERCLA Section 121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Navy's Engineering Field Activity Northwest (EFA NW) has conducted this 5-year review of the remedial actions implemented at NAVMAG Indian Island. This review was conducted from September 2004 through April 2005. This report documents the results of the review.

NAVMAG Indian Island has been addressed as a single operable unit (OU) with nine distinct sites identified and discussed in the ROD (Sites 10, 11, 12, 15, 18, 19, 20, 21, and 22) (Figures 1-1). No Further Action (NFA) was selected in the ROD for Sites 11, 12, 15, 18, 19, 20, and 22. These sites are, therefore, not discussed further in this report. Six additional sites were identified and addressed subsequent to the ROD (Sites 33, 34, 35, 36, EO101, and the Hazardous Waste Storage Area [HWSA]). The six post-ROD sites and the two sites identified in the ROD as requiring remedial action (Sites 10 and 21) are discussed in this report.

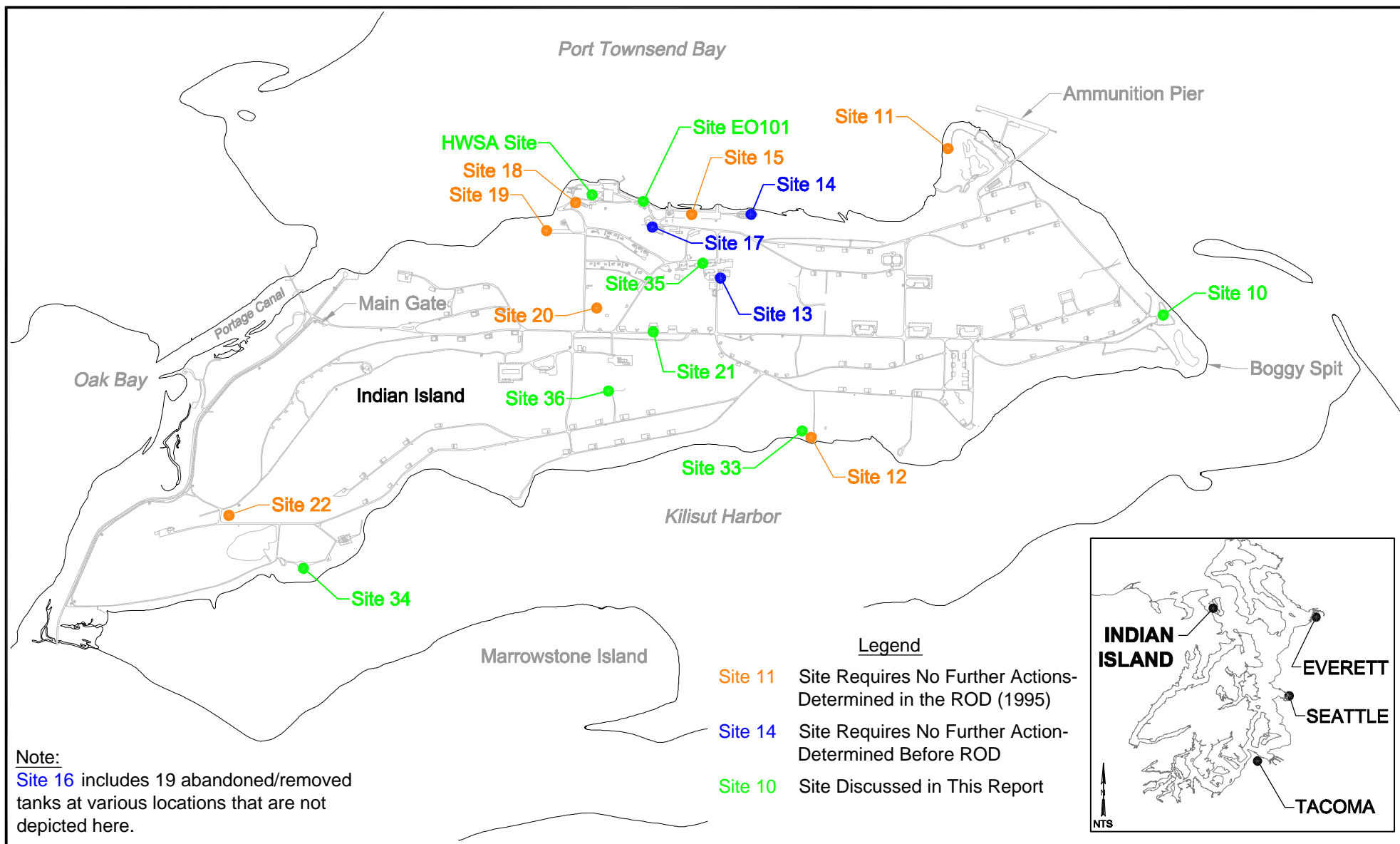
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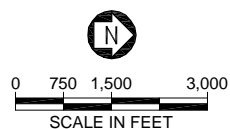
This is the second 5-year review for NAVMAG Indian Island. The triggering action for this review was the completion of the first 5-year review in September 2000 (U.S. Navy 2000c). Contaminants have been left at NAVMAG Indian Island above levels that allow for unlimited use and unrestricted exposure.

The ROD documenting the remedy implemented at NAVMAG Indian Island was signed after October 17, 1986. Therefore, this is considered a statutory, rather than a policy, review.

This report was prepared as part of the CERCLA 5-year review process using Navy and U.S. Environmental Protection Agency (EPA) guidance (USEPA 2004a and U.S. Navy 2001).



U.S. NAVY



**Figure 1-1
 Site Locations**

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 Indian, Island
 SECOND FIVE-YEAR
 REVIEW

2.0 SITE CHRONOLOGY

Table 2-1 lists the substantive events in the chronology of NAVMAG Indian Island related to site discovery, investigation, and remediation.

The Navy purchased Indian Island in 1939 to store explosives, seaplanes, and antisubmarine cable nets. Prior to the establishment of environmental regulations, some wastes were disposed of on the island using practices that were considered acceptable at that time. Some of these practices are now known to be potentially detrimental to human health and the environment. In 1984, the Navy conducted an initial assessment study (IAS) to investigate the possibility of contamination at sites on Indian Island (U.S. Navy 1984).

Thirteen sites (Sites 10 through 22) were identified at Indian Island in the IAS, which also addressed Naval Base Kitsap (NBK) at Keyport, known at the time as Naval Undersea Warfare Engineering Station). Sites 1 through 9 and 23 through 32 are located at NBK at Keyport and are thus not addressed here. The current situation report (CSR) included the results of additional investigation at Sites 10 and 21 (U.S. Navy 1987). The CSR recommended additional investigation of Sites 10 and 21, and planning for a remedial investigation and feasibility study (RI/FS) started in 1989. At the request of the Navy, the Washington State Department of Ecology (Ecology) issued Enforcement Order Number 91-153 in 1991 to ensure that activities and standards meet the requirements of Washington State's Model Toxics Control Act (MTCA).

Indian Island was included on the NPL in June 1994. The final RI/FS report was completed in January 1995 (U.S. Navy 1995). The Proposed Plan presenting the Navy's preferred remedial alternative was distributed for public comment in March 1995, and the Final ROD was issued in September 1995 (U.S. Navy, USEPA, and Ecology 1995). The ROD specified remedial actions for Site 10 (Northend Landfill) and Site 21 (Building 86 Fill Area). Seven sites (Sites 11, 12, 15, 18, 19, 20, and 22) were declared in the ROD to require no further action (assuming unrestricted site use). Sites 13, 14, 16, and 17 were determined to require no additional actions prior to the ROD and were not included in the ROD. Sites 33, 34, 35, 36, HWSA, and EO101 were identified and addressed subsequent to the ROD as Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal actions or Resource Conservation and Recovery Act (RCRA) closures. Table 2-2 provides the name, a brief description, and status of the 18 Indian Island sites. Figure 1-1 shows the site locations, excluding Site 16, which consists of 19 unused tanks at various locations.

Mobilization for remedial construction at Site 10 began in July 1996. Demobilization occurred in May 1997 after the completion of construction activities and before the final inspection by the Navy, Ecology, and EPA on May 7, 1997. Remedial action tasks at Site 21 were completed between 1995 and 1997. On September 26, 1997, the Navy issued the preliminary close out report signifying construction completion (U.S. Navy 1997a). The preliminary close out report included the remedial action report, final inspection report, and operation and maintenance (O&M) manual as appendices. The Final Close Out Report (U.S. Navy 2004b) provides a consolidated summary of remedial activities completed for Site 10, as well as results of compliance monitoring completed at Sites 11, 12, 18, and 21 (as required by the ROD) and removal activities completed at sites identified after the ROD.

As of this second 5-year review, the Navy and EPA are working on removing NAVMAG Indian Island from the NPL (i.e., “delisting”).

Table 2-1
Chronology of Key Events

Event	Date Completed
Discovery and initial assessment study	1984
Current situation report	1987
Ecology enforcement order	1991
National priorities list listing	June 1994
Remedial investigation/feasibility study	January 1995
Record of decision	September 1995
Remedial action construction (Site 10)	July 1996- May 1997
Preliminary close out report	September 1997
RA operations and monitoring	Ongoing
Explanation of significant differences	October 2004
Final close out report	November 2004

Table 2-2
Site Status Summary for Naval Magazine Indian Island

Site No.	Site Name	Description	Status
Ongoing Maintenance and Monitoring			
10	Northend Landfill	Landfill for residential and industrial wastes, 1940s-1970s.	Remediation complete (landfill cap, shoreline protection, and institutional controls prohibiting shellfish harvesting on adjacent beaches and restricting residential/farming land uses, water supply wells, and activities destructive to the cap or shoreline protection system). Monitoring and maintenance are ongoing.
Site Work Complete			
11	Walan Point	Spit of land used for ordnance disposal in late 1940.	Debris removal in 1994. NFA in ROD, but confirmation groundwater monitoring required. Confirmation groundwater monitoring performed 1994–1996. Because no further risks were identified, NFA determination by Ecology in 1996. The interior of Walan Point has been designated as a bird sanctuary by the Navy.
12	Griffin Street Ordnance Disposal Area	Area near the beach used for ordnance disposal in 1940s and 1950s.	Debris removal in 1994. NFA in ROD, but confirmation groundwater monitoring required. Confirmation groundwater monitoring performed 1994–1997. Ecology determined no requirements for further action in 1998.
13	Gas Station Leak	UST leak (gasoline) at gas station (Building 185) in 1979.	The UST was replaced, with no residual soil concentrations exceeding cleanup criteria. Two additional USTs were removed in 1991. Not included in ROD.

Table 2-2 (Continued)
Site Status Summary for Naval Magazine Indian Island

Site No.	Site Name	Description	Status
Site Work Complete (Continued)			
14	Grit Blasting Area	Area adjacent to Bldg. 190 used for cleaning of buoys and related equipment prior to repainting, 1940 to 1950. Blasting grit, paint chips, and paint dust accumulated in piles.	Extraction procedure toxicity tests showed that the material in the piles was not a dangerous waste under RCRA. The piles were disposed of and no confirmation sampling was recommended. Not included in ROD.
15	North Slab Storage Area	Equipment/supplies storage (including paints, solvents, liquid wastes, blasting grit), 1940s to 1970s. Drum storage was discontinued in the 1970s. In the early 1980s, area was reused for equipment and shipping container storage.	Results from soil gas survey (1991) and soil sampling (1992) showed chemicals of potential concern were below cleanup standards. NFA in ROD.
16	Unused Underground Tanks	19 unused USTs at Bldgs. 70, 84, 108 (2 tanks), 116 (2 tanks), 132, 150, 151, 161 (3 tanks), 162, 164, 165, 168, 169, 170, and 190.	USTs were decommissioned/removed prior to the ROD. Not included in ROD.
17	Buried Imhoff Tank	UST used for wastewater treatment.	Tank decommissioned by filling with sand and used as foundation for Bldg. 835. Vent and blower system installed to maintain safe levels of combustible gasses. No additional action required. Not included in ROD.
18	Net Depot	Area used to construct and repair submarine nets and associated equipment, 1940s to mid-1950s. The site included an aboveground tank of rust-preventing dip.	PAH-impacted sediment removed from storm drain in 1994. NFA in ROD. Confirmation sediment monitoring demonstrated no risks. Ecology provided NFA in 1996.

Table 2-2 (Continued)
Site Status Summary for Naval Magazine Indian Island

Site No.	Site Name	Description	Status
Sites Where Site Work Is Complete (Continued)			
19	Public Works Area	Public workshops, mostly active 1940s to early 1950s, with limited operations through 1979. Paints, thinners, and strippers were reportedly disposed of on the ground throughout this time period. The buildings were demolished.	No contamination detected. NFA in ROD.
20	Upper and Lower Boneyards	“Upper Boneyard” used from the 1940s until 1979 to store surplus equipment and materials. “Lower Boneyard” used from the 1940s through the 1970s to store oil, solvents, waste oil, coal, poles, lumber, gravel, and scrap. Frequent small spills and leaks were reported from the drum rack.	No contamination detected. NFA in ROD.
21	Building 86 Fill	Disposal site for waste oils, solvents, electrical equipment, and paint, early 1940s.	ROD-selected remedy required groundwater monitoring for 2 years to determine whether previous detections were anomalous (completed in 1997). Detected concentrations (arsenic) were determined to be attributable to regional background. Ecology provided NFA in 2000.
22	Old Bomb Overhaul Area	Area used to recondition bombs, 1940s to 1970s.	No contamination detected. NFA in ROD.
33	Small Arms Range	Small arms range, 1978-1992. Range expansion in early 1980s included excavating the original target area and placing the soil on the berm on the east side of the range.	1997 soil sampling demonstrated that surface runoff has not contributed significant lead to the environment. Removal of lead-contaminated soil from impact area completed in 2001 achieved cleanup criteria for unrestricted use. NFA determination by Ecology in 2001.

Table 2-2 (Continued)
Site Status Summary for Naval Magazine Indian Island

Site No.	Site Name	Description	Status
Sites Where Site Work Is Complete (Continued)			
34	Open Burn/Open Detonation Range	Active from the 1970s to 1990s.	Removal of lead-, TPH-, and PAH-contaminated soil completed in 1997 achieved cleanup criteria for unrestricted use. Ecology determined NFA under MTCA in 1997. RCRA closure was completed in 2000.
35	Building 154 Floor Drain	Building 154 was a paint and solvent storage facility with a 6-inch floor drain.	In 1997, sampled soil beneath the concrete floor near the drain. No chemicals were detected above MTCA soil cleanup levels. Ecology provided NFA in 1997.
36	New Boneyard	Since 1976, area used for dry storage of timbers, empty drums and tanks, transformers, large buoys, scrap wood, demolition debris, and miscellaneous equipment.	Removal of TPH- and PAH-contaminated soils completed in 2001 achieved cleanup criteria for unrestricted use. NFA determination by Ecology in 2001.
HWSA	Hazardous Waste Storage Area	Between 1985 and 1997, used as less than 90-day storage facility for liquids and solids designated as dangerous and nondangerous wastes.	RCRA closure in 1998, including clean out of the secondary containment basin. Ecology concurred with RCRA closure in 1998.
EO101	Crane Point Ammo Pier	Operated as an ammunition pier since before 1947. From 1978 to 1986, used for mooring Navy vessels. Demolition of the pier was completed in December 1997. Initial visual surveys of the pier area found no ordnance explosives or unexploded ordnance.	A detailed dive search for munitions explosives of concern (MEC) was conducted in April and May 2004. No MEC were found, and the site was recommended for NFA by the investigation team. The Navy explosives safety review board and Ecology concurred with the NFA determination in October 2004.

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Table 2-2 (Continued)
Site Status Summary for Naval Magazine Indian Island

Notes:

Bldg. - building

Ecology - Washington State Department of Ecology

MTCA - Model Toxics Control Act

NFA - no further action

PAH - polycyclic aromatic hydrocarbon

RCRA - Resource Conservation and Recovery Act

ROD - Record of Decision

TPH - total petroleum hydrocarbon

UST - underground storage tank

3.0 BACKGROUND

3.1 PHYSICAL SITE CHARACTERISTICS

3.1.1 Geology

From youngest to oldest, the four principal geologic units on Indian Island are the following:

- Recent alluvium (mixture of relatively loose gravel, sand, and silt)
- Vashon Till (dense sandy silt with some gravel)
- Vashon Advance Outwash (dense sand with gravel)
- Tertiary bedrock (sandstone and shale)

The thickness of debris in the Site 10 Northend Landfill ranges from 4 to 10 feet, and the landfill is underlain by Vashon Advance Outwash sand. The shallow soil at Site 21 is fill (silt and sand with cinder and metal fragments to a maximum depth of 20 feet) used to level the area for construction of Anderson Road. Beneath the fill is roughly 40 feet of silty sand (possibly Vashon Till) that extends to elevations of 80 to 90 feet above mean sea level (msl) and overlies Vashon Advance Outwash sand that extends beyond the depth of exploration at elevation -10 feet msl.

3.1.2 Groundwater

Groundwater on Indian Island occurs at elevations near sea level and in localized shallower zones of perched water in the topographically higher southern portion of the island. In general, groundwater flows from a north-south groundwater divide running along the length of the island, toward discharge locations in Kilisut Harbor on the east and Port Townsend Bay on the west. At Site 10, groundwater occurs at depths less than 10 feet below grade in the Vashon Advance Outwash sand. The lower portion of landfill debris is also saturated. Because Site 10 is located adjacent to Port Townsend Bay, groundwater flow directions change in response to tidal fluctuations; however, the net groundwater flow direction is toward Port Townsend Bay. Site 10 groundwater is too saline to be a drinking water source. At Site 21, groundwater is present in the Vashon Advance Outwash sand at depths between 130 and 140 feet (elevations less than 5 feet above msl). Water level measurements suggest a subtle groundwater divide beneath Site 21, with some flow toward the northwest, but the majority of flow toward the northeast.

3.1.3 Surface Water

Glacial soils across much of Indian Island are generally permeable enough to infiltrate much of the precipitation falling on the island (average of about 19 inches per year). As a result, well-defined surface water channels are largely absent, with the exception of a small intermittent stream on the bedrock in the eastern portion of the island. The only freshwater body is Anderson Pond, located in the southeastern corner of the island. This pond was created when a berm was constructed across a drainage.

3.1.4 Marine Environment Adjacent to Site 10

Port Townsend Bay borders Site 10 to the west, separated from Kilisut Harbor on the east side of Indian Island by Boggy Spit, which contains a tidal lagoon. Based on site and offshore conditions, three wave-energy regimes have been identified for the shoreline adjacent to Site 10. From east to west, they are the Very Low Energy Area (tidal lagoon northeast of the landfill), the High Energy Area (northernmost beach along the landfill), and the Low Energy Area (westernmost beach along the landfill).

The marine waters north of Site 10 and in Kilisut Harbor are major spawning and nursery areas for herring, smelt, cod, salmon, trout, and other fishes. Shellfish (e.g., diverse species of clams) inhabit the beaches near Site 10, but the greatest abundance is farther to the east on Kilisut Harbor. A seal rookery has been observed offshore from Site 10 in Port Townsend Bay. A variety of waterfowl (cormorants, ducks, gulls, etc.) have been observed around Site 10, and bald eagles nest near the site.

3.1.5 Land Use

The nineteen sites identified on Indian Island are located outside of the military residential area. Land use for the sites can be characterized as military industrial or recreational (occasional visitors).

3.2 CONTAMINANTS OF CONCERN

3.2.1 Site 10 (Northend Landfill)

At Site 10, no chemical of concern (COC) was identified for marine sediment or air. COCs for soil included polychlorinated biphenyl (PCB) 1254 and carcinogenic polycyclic aromatic hydrocarbons (cPAHs). COCs in groundwater included metals (arsenic, beryllium, copper, lead, mercury, nickel, and zinc), pesticides (4,4'-DDD, 4,4'-DDT, and gamma-chlordane), and one semivolatile organic compound (SVOC), bis(2-ethylhexyl)phthalate. Shellfish were also

collected on Site 10 beaches and from a reference location away from Site 10 and the tissue analyzed for metals, ordnance compounds, pesticides, PCBs, and SVOCs.

Although there were no screening levels available for shellfish tissue, maximum detected concentrations of some chemicals in samples from Site 10 beaches were higher than those from the reference location. These chemicals included metals (arsenic, cadmium, copper, lead, mercury, selenium, zinc, and some common ions), ordnance compounds (research demolition explosive [RDX], picramic acid, and picric acid), pesticides (4,4'-DDD, 4,4'-DDT, aldrin, alpha-benzene hexachloride [BHC], beta-BHC, lindane, gammachlordane, and methyl parathion), and SVOCs (benzoic acid, bis[2-ethylhexyl]phthalate, di-n-butylphthalate, and pentachlorophenol).

3.2.2 Site 21 (Building 86 Fill)

At Site 21, no COC was identified for soil or air. COCs identified for groundwater included benzene, metals (antimony, arsenic, barium, beryllium, lead, manganese, nickel, and vanadium), and SVOCs (bis[2-ethylhexyl]phthalate and hexachlorobutadiene).

3.2.3 Post-ROD Sites

Site 33 (Small Arms Range). Bullet lead fragments were observed in surface soils at this range, therefore, lead was a suspected COC. A site inspection completed in July 2000 (U.S. Navy 2000a) identified surficial soil at two locations with lead concentrations exceeding the MTCA Method A unrestricted soil cleanup level.

Site 34 (Open Burning/Open Detonation [OB/OD] Range). Lead, petroleum hydrocarbons, and/or polycyclic aromatic hydrocarbons (PAHs) were detected in four areas of surface soil around a former burn pit (U.S. Navy 1996).

Site 35 (Building 154 Paint Shop Floor Drain). During investigation of a floor drain in a solvent and paint storage shed, no fluid, suspect chemical residues, or odors were observed in the drain or soils beneath the shed's concrete slab, and no volatile organic vapors were detected with a photoionization detector (PID). No constituents were detected in the soil sample collected adjacent to the drain at concentrations above MTCA soil cleanup levels for unrestricted use. The investigation findings collectively indicated no evidence of contaminant release through the floor drain (U.S. Navy 1997b).

Site 36 (New Boneyard). Gasoline- and oil-range petroleum hydrocarbons were each detected in one surface soil sample at concentrations above MTCA soil cleanup levels. In addition, detected cPAH concentrations in localized soils slightly exceeded the MTCA soil cleanup levels for unrestricted use, but were below the cleanup levels for industrial use (U.S. Navy 2000b).

HWSA (Hazardous Waste Storage Area). Petroleum hydrocarbon concentrations detected in samples of the concrete slab and soils beneath it exceeded MTCA soil cleanup levels; however, evaluation of the data under Ecology's interim total petroleum hydrocarbon (TPH) policy showed that the concentrations did not pose a risk for human contact or groundwater protection (U.S. Navy 1998a and 1998b).

Site EO101 (Crane Point Ammo Pier). A 2001 Navy review of historical photographs and limited site records indicated the potential presence of munitions and explosives of concern (MEC) in the area of the former munitions loading and offloading pier at Crane Point. A Navy dive team conducted an ordnance survey in April and May 2004, and no MEC were found.

4.0 REMEDIAL ACTIONS

This section provides a brief description of the remedial action as specified in the ROD for Sites 10 and 21. Post-ROD removal actions and RCRA closures at the post-ROD sites are also summarized.

The ROD has been amended by one Explanation of Significant Difference (ESD), dated October 2004. This ESD, signed by the Navy, EPA, and Ecology in 2004, clarifies both the site-specific institutional control requirements and establishes procedures the Navy will follow to implement, maintain, and monitor these site-specific requirements. According to the ESD, the ROD lacked sufficient detail on site-specific institutional controls (including their objectives, geographic locations where they are required, and description of the types of restrictions that need to be in place) to comply with EPA policy (USEPA 2002). The ROD also did not specify how these institutional controls would be implemented, maintained, and monitored, while the Navy has control of the property or if the property were transferred to other federal or private ownership. By addressing the institutional controls requirements in greater detail, the ESD clarified but did not change the selected remedies. The ESD affirmed that the selected remedies remain protective of human health and the environment, comply with federal and state requirements that were identified in the ROD as applicable or relevant and appropriate to the remedial action at the time of the original ROD, and are cost-effective.

4.1 SITE 10 (NORTHEAST LANDFILL)

4.1.1 Remedy Selection

The ROD developed the following primary remedial action objectives (RAOs) for Site 10:

- Reduce contaminants in shellfish to concentrations protective of human health. In the meantime, prevent human consumption of shellfish near Site 10.
- Reduce the transport of chemicals to groundwater or to the marine environment.
- Prevent people from coming in contact with soil containing contaminants that are above MTCA standards.
- Protect from site contaminants the marine life and other animals that may prey on marine life.

To achieve these objectives, the remedial action components specified in the ROD include:

- Placing a landfill cap over approximately 3.7 acres
- Placing erosion protection along approximately 900 linear feet of the landfill perimeter and shoreline
- Possibly removing eroded landfill debris that was located in the intertidal area; excavating landfill contents from the water edge of the landfill in order to construct the erosion protection; and—based on the waste characterization to be conducted—disposing of debris at the Site 10 landfill, a Subtitle D (sanitary) landfill, and a Subtitle C (hazardous waste) landfill, if necessary, or, if possible, recycling material
- Implementing institutional controls, which include a temporary prohibition on shellfish harvesting at Beaches 1, 2, and 19 around Boggy Spit and land use restrictions for residential use and farming. Upon base closure, deed restrictions on activities destructive to the cap and erosion protection will be attached to any property transfer, and requirements for continued operation and maintenance of the landfill cap and erosion protection will be addressed.
- Conducting a monitoring program for groundwater, sediment, and shellfish. Groundwater monitoring will be used to measure the protectiveness of the landfill cap by monitoring the level of contaminants in the pathway from the landfill to the marine habitat. The results of the shellfish monitoring will be used to determine when the shellfish are safe to eat. The results of the monitoring program will be reviewed in detail at the conclusion of the monitoring period to determine whether additional monitoring is necessary.
- Conducting regular maintenance and inspection of the landfill cap and the erosion protection, particularly after storm events
- Conducting periodic reviews

4.1.2 Remedy Implementation

Mobilization and remedial construction of physical components of the remedy began in July 1996. The implementation of archaeological mitigation field activities and collection of vegetation (e.g., willow whips and dune grass) to be used in the shoreline protection system began concurrently with construction mobilization. In August and September 1996, work

progressed to the installation of the armor-rock section of the shoreline protection system in the High Energy Area and the quarry spall base and bench for the Low and Very Low Energy Areas (see Figure 4-1). Approximately 1,000 cubic yards of excavated material from the installation of the armor-rock section were regraded over the old landfill surface and then compacted. The approximately 10,000 cubic yards of import material used for the test fills were regraded and compacted over the site to establish a rough grade. Additional import material was placed to establish a final grade. To reduce environmental impacts, waste was not relocated or disposed of off site. Rather, landfill waste excavated from the intertidal beach during beach cleanup and armor-rock placement was placed and capped within the landfill. As a result, no confirmation and waste characterization sampling and analysis were conducted during the remedial construction.

After final grade was established in October 1996, a gas-collection system was installed in the landfill area. The purpose of the landfill gas system was to vent landfill gas (although none had been detected in studies done for the Olympic Air Pollution Control Authority and, more importantly, to equalize air pressure under the cap from wave action. Various components of the landfill cap (covering approximately 3 acres), soil cover, and storm drains were installed as weather allowed from October 1996 through January 1997. In January, work on the shoreline protection system began again. The log revetment system was installed using duck-bill anchors at the top of the beach along the approximately 300 feet of the Low Energy Area.

After completion of the log revetment system, three layers of vegetative geogrids (approximately 2,700 linear feet) were constructed along the seaward side of the entire landfill cap (February to April 1997). A Tensar grid was installed along the lower section of the vegetated geogrids to protect the vegetation from storms and beach debris during the establishment period. The geogrids range from 18 to 24 inches thick and were constructed with soil in fabric wraps and sand bags. Willow whips were placed between each geogrid lift, and the face of each geogrid was seeded. The top, or bench, of the final geogrid lift was planted with native vegetation, as was the cobble and sand bench above the armor rock at the High Energy Area. In April 1997, a 2-foot soil cover (completed with topsoil as the top 6 inches of the cover) was placed over the landfill cap and hydroseeded with native grass and wildflowers. Planting on the geogrid and peripheral areas was completed in April 1997. The finishing ancillary cap features (e.g., gravel resurfacing, irrigation system, culverts, and surface gas vents) were installed in April 1997. The site was demobilized in May 1997 after the completion of construction activities and the pre-final inspection by the Navy, Ecology, and EPA on May 7, 1997.

On September 26, 1997, the Navy issued the preliminary close out report (U.S. Navy 1997a) signifying successful completion of construction activities. This report included the remedial action report, final inspection report, and O&M Plan as Appendices A, B, and C, respectively.

Post-construction maintenance activities and monitoring for Site 10 are described in Section 4.1.3.

The institutional controls component of the Site 10 remedy was satisfied by the Institutional Controls Management Plan (ICMP) and the associated land use control instruction prepared by the Navy in 2000 (U.S. Navy 2000d).

The CERCLA 5-year review process, as described in this report, satisfies the periodic review component of the remedy.

4.1.3 Operation, Maintenance, and Monitoring

Five post-construction monitoring programs have been implemented at Site 10:

- Groundwater monitoring
- Beach habitat monitoring
- Beach profile monitoring
- Marine (shellfish and sediment) monitoring
- Annual institutional controls inspections

Operation, maintenance, and monitoring (OM&M) activities began in June 1997, immediately following completion of the Site 10 remedial action in May 1997. The maintenance and monitoring plans for Site 10 have been updated periodically since 1997 to reflect changing conditions at the site and changing monitoring requirements.

Maintenance

Maintenance activities have included inspection, routine maintenance, and repair of the functional features of the landfill cap and shoreline protection system. These functional features include the landfill cap system, landfill gas collection system, landfill perimeter road, stormwater drainage system, irrigation system, hillside and site access road inspection, log revetment/anchor system, armor-rock shoreline protection system, and the vegetated geogrid.

Because the vegetative component of the shoreline protection system was based on new and evolving technology that had never been used in a marine shoreline environment, this part of the project was conducted as a “demonstration” project. Therefore, the inspection and maintenance program is an integral component to the success of this demonstration project.

Over the course of several years, the inspections showed that the geogrids, rock revetments, and the beach areas seaward of these features were stable with little or no damage or erosion. However, a portion of the anchored-log revetment area located just west of the high-energy rock revetment area suffered repeated damage, requiring periodic repair or replacement of the anchored logs. Even after repeated repairs, because of erosion in this area, metal debris eventually appeared along the cut bank of the beach.

Because of the danger of exposing landfill debris in this one erosive area along the beach, a more permanent repair was made in late 2003 and early 2004. The portion of the existing anchored-log revetment that was subject to repeated damage was removed and replaced with a rock revetment (see Figure 4-1). This repair extended the existing rock revetment area slightly farther west along the shoreline (U.S. Navy 2004c).

Other changes, such as rerouting a beach access path, installing additional signage to caution the maintenance crew against mowing specific areas, and more rigorous removal of invasive weeds from the landfill cap have been made, as necessary, to maintain integrity of the landfill cap and shoreline protection system.

Groundwater Monitoring

The ROD required quarterly groundwater sampling and analysis of one upgradient and four nearshore monitoring wells for 2 years. The ROD states that the groundwater monitoring data will be used for the following:

- To determine the impact and effectiveness of the landfill cap and shoreline protection system on groundwater quality
- To establish trends of groundwater quality over time
- To help evaluate the need for shellfish harvesting restrictions at the beaches adjacent to the landfill

The ROD states that groundwater monitoring results will be compared to surface water standards not as an attainment goal, but to evaluate trends in chemical concentrations. If trends in the four nearshore monitoring wells indicate that chemical concentrations are declining following the remedial action in a manner consistent with long-term attenuation, groundwater monitoring will be discontinued and the marine monitoring program will serve as the indicator of impacts of groundwater migration to the marine environment.

In fulfillment of these ROD requirements, 15 rounds of post-construction compliance groundwater sampling have been conducted to date (June and October 1997; January, April, June, October, and December 1998; April 1999; January and December 2000; June 2001; June 2002; and January, June, and December 2003). The data are summarized in the Round 15 summary report (U.S. Navy 2004d). For each round, five groundwater monitoring wells, including one upgradient well (MW10-8), one well within the landfill (MW10-6), and three downgradient wells along the shoreline (MW10-10, MW10-11, and MW10-12), were sampled at low tide using low-flow procedures (Figure 4-1).

Results of the first eight rounds of monitoring were included in the first 5-year review. These groundwater samples were analyzed for the groundwater constituents of concern listed in the ROD (bis[2-ethylhexyl]phthalate, DDT, DDD, gamma-chlordane, and total and dissolved arsenic, beryllium, copper, lead, mercury, nickel, and zinc). Samples were also analyzed for diesel-range petroleum hydrocarbons, ordnance, and selected conventional parameters.

Statistical analysis of the first eight rounds of compliance groundwater monitoring data indicated few significant changes in site groundwater quality (U.S. Navy 2001a). Diesel-range petroleum hydrocarbons were detected in MW10-6 and MW10-10 at relatively low concentrations (up to 440 µg/L) and appeared to be attenuating. Low estimated concentrations of pesticides (DDD to 0.009 µg/L, DDT to 0.03 µg/L, and gamma-chlordane to 0.008 µg/L) were detected sporadically in the wells within and downgradient of the landfill. Detected arsenic concentrations above regional background concentrations (approximately 5 µg/L) were limited to the westernmost downgradient well MW10-12 (9 to 16 µg/L) and remained well below the marine chronic water quality standard of 36 µg/L [U.S. Navy 1999a]. Iron in well MW10-6, located within the landfill, was the only constituent observed to be increasing in concentration over the eight rounds.

After the eight rounds of groundwater monitoring, the basis for evaluating remedy effectiveness and potential impacts to groundwater quality was reassessed by the Navy in the Final Site 10 Monitoring Plan, Revision 0, (U.S. Navy 2000e). This plan established that, for monitoring Round 10 and beyond, the groundwater samples would be analyzed for total and dissolved iron, total and dissolved arsenic, and general chemistry parameters, including dissolved oxygen.

The results of the groundwater monitoring conducted after the first 5-year review are summarized in Section 6.4.1.

Beach Profile Monitoring

The purpose of the beach profile monitoring is to determine whether the beach below the Northend Landfill is aggrading or eroding and how this may affect the integrity of the remedy.

Initially the monitoring was conducted during the spring and fall to capture the influence of winter and summer longshore drift patterns. The pre-construction survey was completed in October 1995. Following construction of the landfill cap and shoreline protection system, surveys were completed in October 1997, April and November 1998, and April 1999, in accordance with the O&M Plan (Appendix C to U.S. Navy 1997a).

The surveys were performed along pre-established transects that are oriented approximately perpendicular to the shoreline. The transects begin at monuments established on top of the geogrid. The transect survey data are processed to create cross sections of the beach profile for each survey. Results of the initial beach transect monitoring showed that, over time, there was no significant aggradation or erosion to the beach.

Over time, an Intermediate Energy Area developed between the stable High Energy Area (rock revetment) and Low Energy Area (log revetment), where several logs secured with anchor bolts had broken away and needed to be secured again. Scouring and beach erosion were noted behind some logs in the Intermediate Energy Area. The erosion uncovered some metal debris that was situated outside of the landfill cap. Sand and gravel were replaced, but continued to be washed away by the scouring action. Repositioning of the logs with additional anchors was attempted but did not succeed in reducing erosion in this area. As a result, the high-energy rock revetment was extended to cover this area, as described earlier under *Maintenance* and shown on Figure 4-1.

Beach erosion inspections along the transects have continued annually (in June) in accordance with the Site 10 Maintenance Plan, Revision 1 (U.S. Navy 2004e). Comparison of transect profiles over time determines if the beach is receding or accreting and, thus, whether additional maintenance or repair are required to maintain the integrity of the shoreline protection system.

Beach Habitat Monitoring

The purpose of the intertidal beach habitat survey was to evaluate the beach habitat and major organisms that inhabit the beach bordering the Northend Landfill following implementation of the selected remedy. The pre-construction survey was completed in October 1995. Following construction, surveys were completed in October 1997 and November 1998 (U.S. Navy 1999b).

The intertidal beach habitat surveys were conducted along the transects used for the beach profile monitoring described above. The survey consisted of a physical habitat survey and a biological survey. The physical habitat survey documented the physical conditions (substrate) of the beach surface at selected locations along the transects. The biological survey identified the presence of marine organisms and the specific habitat type in which they occur along six of the transects. The key indicator species for the biological survey were clams, because they are sessile

organisms that are unlikely to move or change in abundance substantially over time and season. The presence and general abundance of other organisms were also recorded.

Changes in substrate conditions include the creation of a gravel bar and slightly sandier conditions within the tidal lagoon (Very Low Energy Area) and a change from fine gravel to sand on the upper beach of the Low Energy Area. No substantive changes to substrate were observed in the High Energy Area (excluding the presence of the riprap placed during construction).

In the Very Low Energy Area, the diversity of clam species in the 1998 survey was similar to that in the 1995 pre-construction survey (with soft shell clams, bent nose clams, littleneck clams, and polluted macoma). In the 1997 survey, only bent nose clams were observed. In the High Energy Area, reductions in numbers of butter clams and horse clams relative to 1995 were observed. Numbers of littleneck clams were similar in 1998 to the 1995 numbers, and the white sand clam was observed in 1998 but not in the previous two surveys. In the Low Energy Area, littleneck clams were observed in 1995 and 1997, but not in the 1998 survey (U.S. Navy 1999b).

Because of the observed overall stability of the beach during the 1997 and 1998 surveys, detailed beach habitat surveying was discontinued after 1998 in favor of general visual inspections by Navy environmental staff.

Marine Monitoring

Because of potential human health concerns associated with site contaminants, shellfish harvesting restrictions were imposed on three beaches (1, 2, and 19) around Boggy Spit (Figure 4-2). The ROD required a marine monitoring program to determine when the shellfish are safe to eat and restrictions may be terminated. The overall objectives for the marine monitoring program are the following:

- Determine when chemical concentrations in clam tissue are at or below acceptable human health risk-based criteria.
- Evaluate ecological risks by comparing sediment analytical data to the Washington State Sediment Management Standards (SMS). In addition, a qualitative comparison of clam and sediment analytical data may indicate trends associated with the biotic transport of the chemicals.

The ROD states that the shellfish monitoring will continue until estimated human cancer risk from shellfish ingestion is reduced to 1 in 100,000 (1×10^{-5}) and the noncancer hazard index (HI) is reduced to 1, or background risk levels, whichever comes first. The ROD states a target time frame of 10 years for achieving this goal. The monitoring program results were to be used to evaluate the effectiveness of the remedial action and determine whether additional monitoring would be required in subsequent years.

The 1997 Marine Monitoring Plan (MMP) (U.S. Navy 1997c) was developed to fulfill the ROD's requirement for a sediment and shellfish monitoring program. The MMP specified that shellfish sampling and analysis would occur two times in 5 years, with an evaluation of the results to occur at a minimum of once every 5 years and that monitoring would be terminated once the ROD's acceptable risk criteria have been met, or risks are at background levels.

Sampling under the MMP consisted of the collection and chemical analysis of littleneck clams and sediment samples from pre-established locations at the restricted beaches adjacent to Site 10 and one background location at Samish Bay. Two rounds of marine monitoring were completed under the MMP in May 1998 and May 2000. Following the May 2000 sampling event, the MMP was replaced with the Final Site 10 Monitoring Plan, Revision 0 (U.S. Navy 2000e).

In 1999, Indian Island increased ordnance handling operations at the ammunition pier located less than a mile southwest of Site 10. A safety restriction area associated with the ordnance handling includes Site 10 and surrounding beaches. Activities such as shellfish harvesting are not permitted within the restricted area. At a future date to be determined by the Navy, the safety restriction may be lifted from the beaches adjacent to Site 10. As long as the expanded safety restriction area encompasses Site 10 beaches and the ROD marine monitoring requirements have not been met, the shellfish monitoring described in the Final Site 10 Monitoring Plan, Revision 0 (U.S. Navy 2000e) would be completed once every 5 years, in conjunction with the 5-year review. The 5-year monitoring frequency was discussed and agreed upon by the Navy, Ecology, and EPA at a meeting on April 3, 2000. Future shellfish sampling and analysis conducted under the ROD would involve collection of littleneck clams from Beaches 1, 2, and 19, and chemical analysis of the tissue for metals. The existing data demonstrate concentrations in sediment below the Sediment Quality Standards (SQS) or background concentrations, thus, additional sediment monitoring would not need to be completed. These revised sampling requirements were retained in the Final Site 10 Monitoring Plan, Revision 1 (U.S. Navy 2002). Sampling was carried out under Revision 1 of the plan in June 2004, in support of this second 5-year review.

When the explosives safety restriction is lifted from the Site 10 area, the Navy will coordinate with the appropriate agencies (including Ecology, EPA, Department of Health, and tribes) on the need for and scope of additional shellfish sampling and analysis and other considerations for re-

opening of the beaches for shellfish harvesting, in accordance with Department of Health requirements.

The results of the sampling events in 1998 were included in the 5-year review and are briefly summarized here. Neither the 1998 sediment data, nor the risk assessment analysis of the 1998 shellfish tissue indicated a significant health risk might be present. The sediment data were below health-based standards, and the human health risk from shellfish consumption only slightly exceeded the target goals in the ROD.

Sediment Quality Data. The 1998 sediment quality data demonstrated no detected concentrations above Washington State's most stringent sediment quality criteria—the SQS. For those samples in which sediment organic carbon was too low (below 0.5 percent) for comparison of organic chemical concentrations against the SQS (criteria for most organic chemicals are normalized for organic carbon content), the organics' concentrations were compared against apparent effects threshold (AET) values based on dry weight (not carbon normalized) concentrations. No detected concentrations in sediment exceeded the AETs (U.S. Navy 1999c).

Human Health Risk Assessments for Shellfish Consumption. Using the 1998, 2000, and 2004 shellfish quality data, human health risk assessments (HHRAs) were prepared to estimate risks to assumed subsistence harvesters of shellfish from the Site 10 beaches (U.S. Navy 1999d, 2001b, and 2004f). The 1999 HHRA also calculated risk-based concentrations (RBCs) for shellfish tissue based on safe concentrations for an assumed subsistence consumption scenario.

In the 1998 monitoring event, 12 chemicals were identified in the shellfish tissue samples at concentrations above those from the Samish Bay background location. The reasonable maximum exposure (RME) noncancer hazard quotient (HQ) for those 12 chemicals was 1.1, essentially at the regulatory risk management threshold of 1.0. Of those 12 chemicals exceeding background, only arsenic contributed to the estimated RME cancer risk (8×10^{-5}). However, the background arsenic concentration (as determined from the single background sample) accounts for more than one-half of that estimated risk (a noncancer HQ of 0.7 and a cancer risk of 5×10^{-5}).

RBCs based on the subsistence ingestion exposure scenario were calculated assuming subsistence consumption (an individual consuming 76 pounds of shellfish from the three beaches every year for 70 years, i.e., 130 grams/day) (U.S. Navy (1999d). In calculating RBCs for arsenic, inorganic arsenic (more toxic than the organic forms) was assumed to comprise 1 percent of the total arsenic concentration measured in shellfish. The 1 percent factor was taken from an Agency for Toxic Substances and Disease Registry (ATSDR) study at nearby Marrowstone Island, where inorganic arsenic accounted for 1 percent of total arsenic detected in littleneck clams (ATSDR 1998). The arsenic RBC was based on a cancer risk of 1×10^{-4} ,

because the dose-response curve for low-dose arsenic exposure likely shows a threshold dose below which arsenic would not cause cancer (see U.S. Navy 1999d for further discussion).

The results and analysis of the tissue and sediment sampling events in 2000 and 2004 are summarized in Section 6.4.2 (data collected subsequent to the first 5-year review).

4.2 SITE 21 (BUILDING 86 FILL)

4.2.1 Remedy Selection

The primary RAO defined in the ROD for Site 21 is to prevent people from drinking groundwater that contains contaminants of concern at levels above federal maximum contaminant level (MCLs), state-specific applicable or relevant and appropriate requirements (ARARs), and MTCA levels.

To achieve this objective, the remedial action components specified in the ROD include the following:

- Conduct groundwater monitoring using low-flow extraction or other techniques to reduce turbidity periodically for a 2-year period and to determine whether the detections of certain chemicals in groundwater during the RI were anomalous. This would require the construction of one additional monitoring well.
- At the conclusion of the monitoring period, screen the analytical data against MTCA cleanup levels, state-specific ARARs, and federal MCLs. If chemical concentrations present in the groundwater samples are acceptable to the Navy, Ecology, and EPA, no further action will take place. If concentrations are not acceptable, the Navy, Ecology, and EPA will determine whether additional action or monitoring are necessary. Additional actions may include establishment of background levels, deed restrictions, well abandonment, and periodic review.

4.2.2 Remedy Implementation

The Navy completed the selected remedy for Site 21 by accomplishing the following tasks between 1995 and 1997:

- Installed a new groundwater monitoring well (MW21-5) to replace well MW21-2, which had excessive turbidity and poor yield and was thus decommissioned in accordance with state regulatory requirements.

- Removed Hydrostar pumps from the three existing wells and installed dedicated Grundfos Redi-flo 2 submersible pumps at three existing wells and one new well.
- Completed low-flow groundwater sampling and analyses at the four wells twice a year from 1995 to 1997 (four rounds). The groundwater samples were analyzed for volatile organic compounds (VOCs), SVOCs, and total and dissolved metals, as specified in the ROD.
- Measured static groundwater levels from the four wells six times during the first year of compliance monitoring and two times during the second year. Potentiometric maps were generated to assess potential seasonal effects on site groundwater flow directions.

Field activities and the results of the 2-year compliance monitoring program are summarized in the final year two compliance monitoring and sampling report (U.S. Navy 1998c). The previously detected benzene, bis(2-ethylhexyl)phthalate, and hexachlorobutadiene were not detected in any of the four rounds of sampling and analysis. Detected concentrations of antimony, arsenic, beryllium, lead, manganese, and nickel among the four wells were very low. Detections (except manganese in MW21-5 in Round 1) were below their associated contract-required detection limits, but above their associated instrument detection limits (estimated range). Manganese was detected in MW21-5 above the 50 µg/L secondary MCL in Round 1, but was not detected during the three subsequent rounds of sampling and analysis. This manganese detection was interpreted as an artifact of installing the new well (U.S. Navy 1998c). Subsequent evaluation of the arsenic data demonstrated that the low detected concentrations (1.0 to 4.2 µg/L, estimated) are consistent with regional background concentrations (U.S. Navy 1999e).

Based on review of the compliance monitoring data, Ecology concurred that no further action is necessary for Site 21 (Ecology 2000).

4.3 POST-ROD REMOVAL ACTION SITES

4.3.1 Site 33 (Small Arms Range)

A CERCLA non-time-critical removal action (NTCRA) was completed at Site 33 in May 2001. The two surface soil sample locations with lead concentrations above the unrestricted soil cleanup level were excavated. Verification analytical results confirmed that residual lead concentrations in the excavations were below the MTCA Method A unrestricted soil cleanup level, indicating that the NTCRA objectives had been achieved. The excavations were backfilled with on-site gravel and regraded. The excavated soil was sampled for waste designation and disposed of appropriately at a permitted landfill. Following the NTCRA, institutional controls

are not required for protection of human health and the environment at Site 33. Ecology issued a determination of “no further action” (NFA) for Site 33 on November 28, 2001 (Ecology 2001).

4.3.2 Site 34 (Open Burn/Open Detonation Range)

Site 34 was remediated under a post-ROD CERCLA removal action. Between October 1996 and January 1997, 285 tons of contaminated soil were removed from four locations exhibiting contaminated surface soil. The soil was disposed of as problem waste at a local permitted landfill. Verification soil sampling and analysis indicated that MTCA Method A unrestricted soil cleanup criteria had been met. Site restoration was completed by backfilling and regrading (U.S. Navy 1998d). Following review of the cleanup action and associated verification data, Ecology concluded that no further action is required at Site 34 under MTCA (Ecology 1997a). Following the removal action, institutional controls are not required for protection of human health and the environment at Site 34.

Site 34 was operated as an interim status dangerous waste management unit under RCRA (Washington Administrative Code [WAC] 173-303-400 under state regulations). Site 34 was closed under RCRA, as documented in the July 2000 closure report (U.S. Navy 2000f).

4.3.3 Site 35 (Building 154 Floor Drain)

Following review of the field investigation results, Ecology concluded that there was no evidence of releases or threatened releases of hazardous substances at the site, and therefore, no further action is required at Site 35 under MTCA (Ecology 1997b). Institutional controls are not required for protection of human health and the environment at Site 35.

4.3.4 Site 36 (New Boneyard)

Site 36 was remediated as a post-ROD CERCLA NTCRA in January and May 2001. In January 2001, the two petroleum-contaminated locations were excavated to a depth of 2 feet. The verification sampling results confirmed that residual petroleum concentrations in the excavations were below MTCA Method A unrestricted soil cleanup levels. The excavations were backfilled with imported gravel. The petroleum-contaminated soil was disposed of at the Olympic View Sanitary Landfill in Bremerton, Washington.

Creosote-treated timbers and net pen blocks suspected of being a PAH source were also removed from the site at that time and either disposed of or beneficially reused off site. Seven of the 19 blocks were disposed of at Columbia Ridge Landfill in Arlington, Oregon. The remaining 12 were taken off site by the Navy for reuse at another facility. Verification sampling and analysis of the soils beneath the former creosote-treated timber and net pen blocks indicated residual

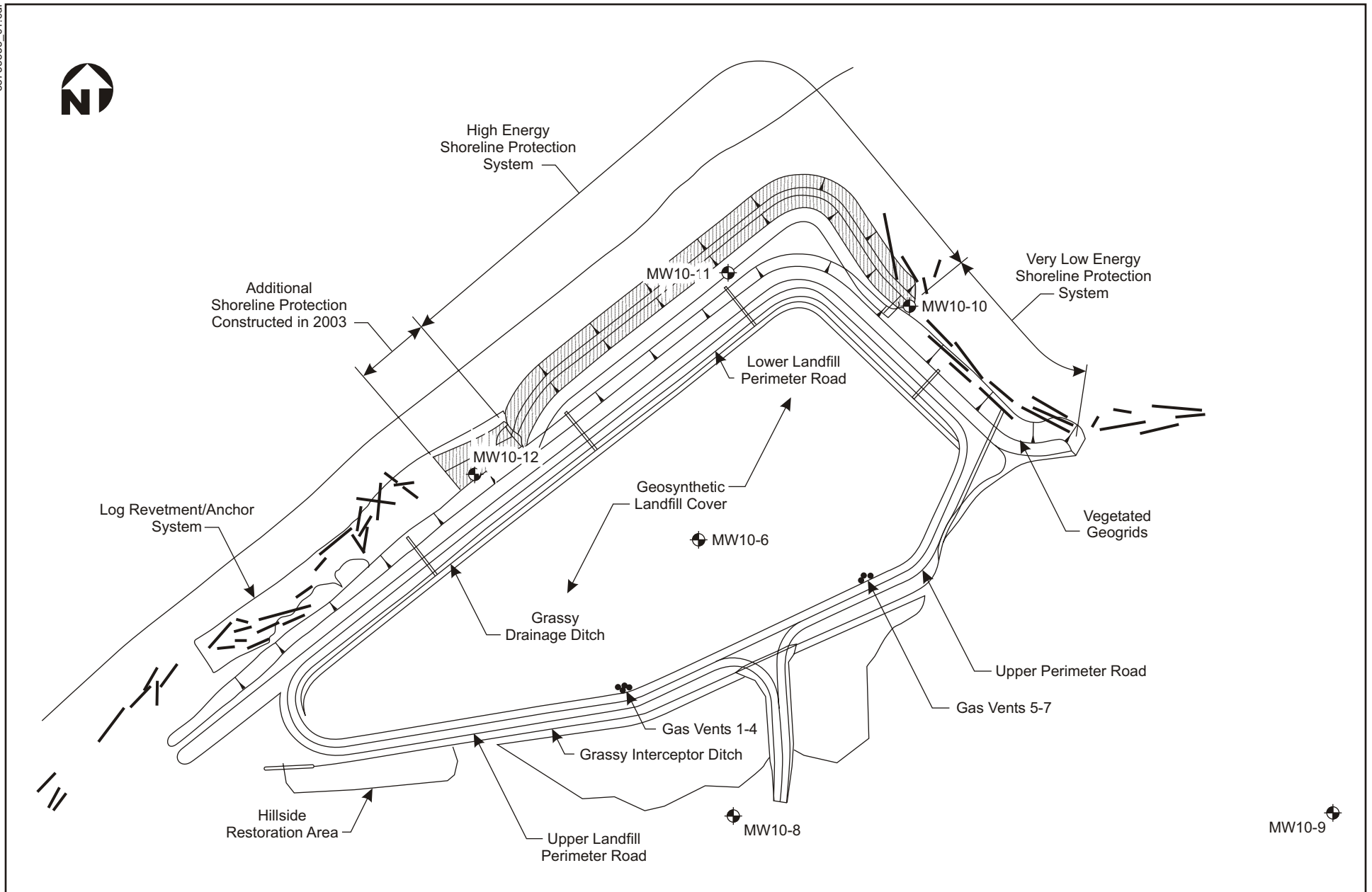
cPAH concentrations below MTCA soil cleanup levels for industrial use, but above those for unrestricted use at two sample locations. These data were consistent with previous cPAH exceedances (for unrestricted use) in this location, based on the 1999 site investigation data.

Because the site investigation data indicated cPAH concentrations in soil above those acceptable for unrestricted use, institutional controls had previously been established for Site 36 to restrict residential use, farming, and construction of water supply wells, as described in the ICMP for Indian Island (U.S. Navy 2000d).

However, the estimated volume of cPAH-contaminated soils was small and could be addressed cost-effectively as part of the Site 36 NTCRA. Therefore, the Navy excavated these soils in May 2001, thereby eliminating the need for institutional controls at Site 36. The verification sampling results confirmed that residual cPAH concentrations in the excavations were below MTCA unrestricted soil cleanup levels. The excavated soils were sampled and analyzed for waste designation and disposed of appropriately at a permitted landfill. The excavations were backfilled with imported gravel. As a result of the NTCRA, institutional controls restricting use of Site 36 are no longer required for protection of human health and the environment. The Navy intends to coordinate with EPA and Ecology regarding this change to the ICMP.

4.3.5 SITE EO101 (CRANE POINT AMMO PIER)

Because no indications of the presence of MEC were found during the April and May 2004 survey, Site EO101 was recommended for NFA in August 2004 (U.S. Navy 2004g). Ecology concurred with this finding in October 2004 (Ecology, 2004).

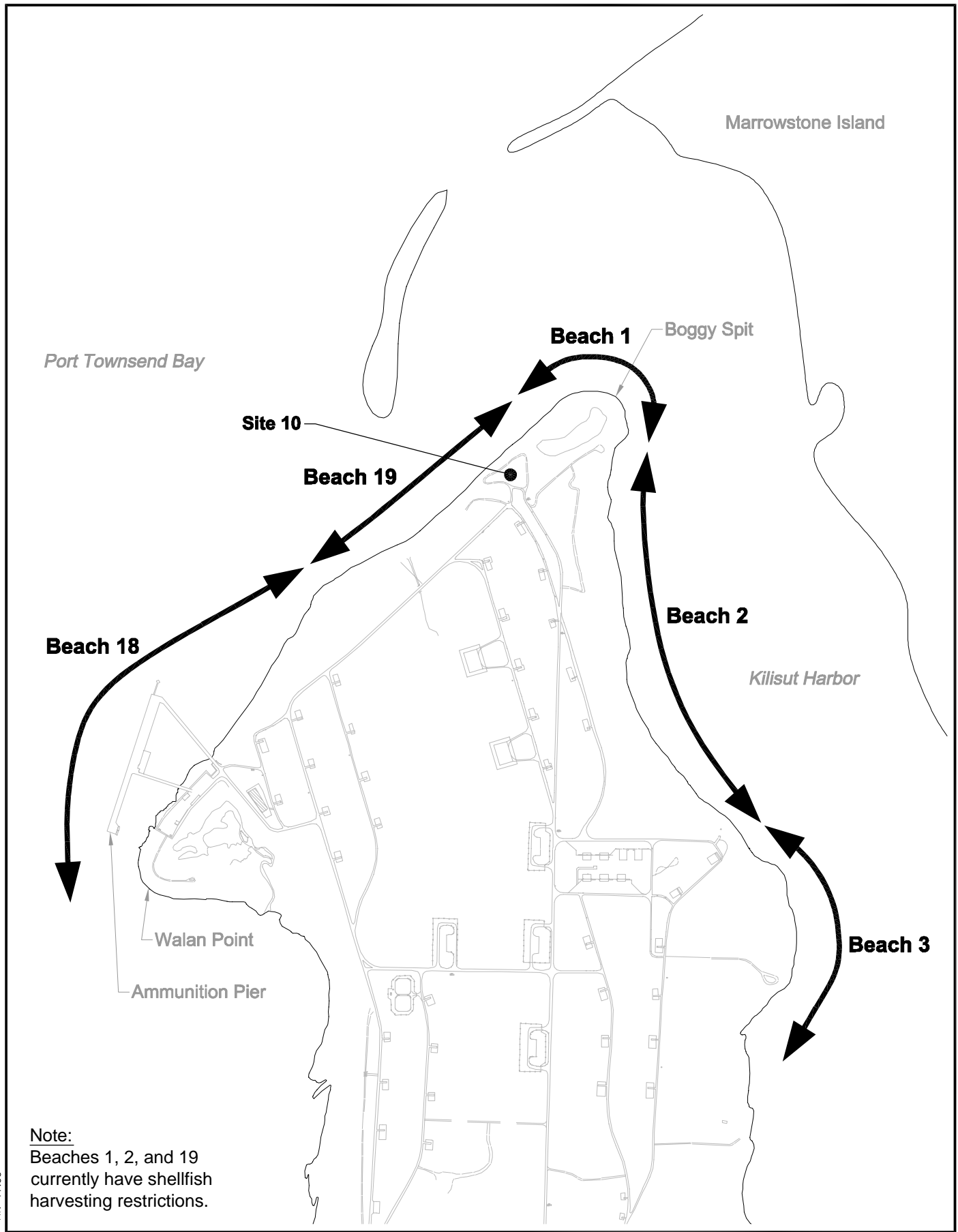


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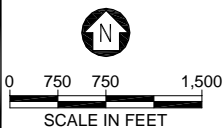
Figure 4-1
Components of the Landfill Cap
and Shoreline Protection System

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 Indian Island
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 REVIEW



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**Figure 4-2
Beach Locations**

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5.0 PROGRESS SINCE LAST 5-YEAR REVIEW

No deficiencies were noted in the first 5-year review (U.S. Navy 2000c) that required action prior to this second 5-year review. The first 5-year review found that the remedies for Sites 10 and 21 (the two sites in the ROD that required action) were protective of human health and the environment. In fact, shortly after publication of the first 5-year review, Ecology agreed to a NFA determination for Site 21. The actions taken at post-ROD sites 34, 35, and HWSA were found to be protective, and the planned actions for Sites 33 and 36 were expected to be protective when complete. Site EO101 had not been identified at the time of the first 5-year review.

Since the first 5-year review, the Navy has completed the actions at Sites 33 and 36. The Navy also identified and took action at post-ROD Site EO101. The Navy has continued with required monitoring and inspections. Based on completion of remedial and removal activities at all sites at NAVMAG Indian Island, including the post-ROD sites, the Navy submitted the final close out report for the base (U.S. Navy 2004b) and began the process of delisting NAVMAG Indian Island from the NPL. These actions taken since the first 5-year review are summarized in Table 5-1.

Table 5-1
Actions Taken Since Previous 5-Year Review

Location	Actions	Date of Removal Actions
Site 33	Removal action to excavate and dispose of soil with elevated lead concentrations. NFA concurrence obtained from Ecology.	May 2001
Site 36	Removal action to excavate soil containing petroleum and carcinogenic polycyclic aromatic hydrocarbon. Removal of debris. NFA concurrence obtained from Ecology.	January and May 2001
Site EO101	Identified site as possible location of munitions and explosives of concern (MEC). Planned and conducted an underwater survey that found no MEC. Obtained Ecology concurrence on NFA.	April and May 2004
Entire Base	Submitted final close out report and began delisting process	October 2004

Notes:

Ecology - Washington State Department of Ecology

NFA - no further action

6.0 FIVE-YEAR REVIEW PROCESS

6.1 FIVE-YEAR REVIEW TEAM

The Navy is the lead agency for this 5-year review. Personnel from EFA NW, NBK at Bangor, and NAVMAG Indian Island represented the Navy in this 5-year review. Project managers and other staff from the EPA and Ecology, the other 5-year review team members, have participated in the review process. Both the EPA and Ecology are cosignatories of the ROD for NAVMAG Indian Island. All team members had the opportunity to provide input to this report.

6.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

6.2.1 History of Community Involvement

The Navy has maintained an on-going commitment to community involvement since the time of the first investigations at NAVMAG Indian Island. The community has been informed of progress at the site through fact sheets, published public notices, open houses, and public meetings. The proposed plan was circulated for public comment prior to finalization of the ROD. Key documents have been made available for review at the Jefferson County Library in Port Hadlock, Washington.

A community relations plan was prepared in 1989 and updated in 1992 and 1995. In 1991, a Technical Review Committee (TRC) was established, with representatives from the public and governmental entities including the Suquamish Tribe, the Northwest Indian Fisheries Commission, and the Washington State Department of Wildlife. The TRC was replaced with a Restoration Advisory Board (RAB) in mid-1995. The RAB members include representatives of the Navy, regulatory agencies, civic groups, private citizens, tribal governments, local governments, and environmental activist groups.

6.2.2 Community Involvement During Second 5-Year Review

The Navy notified the public via a newspaper advertisement on September 23, 2004 (*Peninsula Daily News*) that this second 5-year review was being performed. The advertisement provided instructions for the public to comment on the protectiveness of the remedy. The completed second 5-year review report was made available to the public at the Jefferson County Library.

Although the RAB at NAVMAG Indian Island is no longer active, a former RAB member was located and invited to comment on the second 5-year review. The RAB member declined to comment, stating that he had not had involvement with remedy implementation in the last few years.

6.3 DOCUMENT REVIEW

Documents reviewed during this 5-year review were those that described the monitoring of the selected remedies over the last 5 years, the ROD in which the selected remedies were described, and the ICMP for NAVMAG Indian Island.

The primary documents that were reviewed are:

- The signed ROD (U.S. Navy, Ecology, and USEPA 1995).
- The first five-year review (U.S. Navy 2000c).
- The ICMP (U.S. Navy 2000d)
- The long-term monitoring reports (groundwater, shellfish, and sediment monitoring) (U.S. Navy 2001a, 2001c, 2004d, and 2004h)
- The long-term monitoring plans (U.S. Navy 1997c, 2000e, and 2002)
- The shellfish human health risk assessments (U.S. Navy 2001b, 2001c, and 2004f)
- The final site inspections at several sites (U.S. Navy 2000a, and 2000b)

Review of these documents provided much of the information included in Sections 3 and 4 regarding the description of the sites, the RAOs and selected remedy components for each site, and the status of remedy implementation and monitoring at each site.

6.4 DATA REVIEW

Subsequent to the first 5-year review, long-term monitoring data to assess the functionality of the remedy has been collected only at Site 10. This section summarizes the data collected since the first 5-year review.

6.4.1 Groundwater Monitoring at Site 10

Fifteen rounds of post-construction compliance groundwater sampling have been conducted to date. Nine sampling rounds were available at the time of the first 5-year review, and six additional sampling rounds have been conducted since then. All groundwater monitoring has been conducted at the same five groundwater monitoring wells, including one upgradient well (MW10-8), one well within the landfill (MW10-6), and three downgradient wells along the shoreline (MW10-10, MW10-11, and MW10-12) (Figure 4-1).

Initial sampling and analysis of groundwater at Site 10 included chemical analyses for all COCs as well as groundwater quality parameters (the first nine sampling rounds of groundwater data, discussed in the first 5-year review and Section 4.1.3 of this review). Beginning with round 10 of the groundwater monitoring, arsenic, iron and groundwater quality parameters were selected as the appropriate analytes. Iron was the only chemical to show a trend (increasing concentrations) in the first nine sampling rounds. The Final Site 10 Monitoring Plan, Revision 0 (U.S. Navy 2000e) established the logic that, because some of the iron in groundwater is expected to be in colloidal form that should be readily transported by groundwater from the landfill, iron can be used as a tracer for the mobility of other landfill chemicals. The monitoring plan concluded that iron should be the first parameter to impact the intertidal area. Thus, if iron concentrations increase significantly, there is reason to suspect that other contaminants may also be migrating in site groundwater (U.S. Navy 2000e).

Based on this concept and using the existing data, calculations were made in the Final Site 10 Monitoring Plan for upper and lower 95 percent confidence levels (UCLs) (based on t-test distributions) for total and dissolved iron concentrations in each monitoring well and for total and dissolved arsenic in MW10-12. If future concentrations exceed these upper limits in the landfill or downgradient wells, the groundwater monitoring program would be reevaluated, with the possibility of expanding the list of analytes.

Total and dissolved iron concentrations were reported to exceed the 95 percent UCLs (U.S. Navy 2001a) in Round 10 of the monitoring activities. The Navy concluded that a reevaluation of the Site 10 groundwater monitoring program was required upon review of these data. The Navy completed the Site 10 groundwater monitoring program reevaluation in July 2001. The results indicated the following:

- Arsenic was the only remaining parameter with concentrations above the ARARs for Site 10.
- Arsenic groundwater concentrations have remained steady and display no indication of increasing trends.

- The data set did not provide sufficient geochemical data and monitoring duration to evaluate whether overall groundwater conditions at Site 10 were stable.
- Iron was not an appropriate indicator for assessing potential near-shore sediment impacts associated with the landfill, because iron concentrations would be expected to change rapidly due to iron's extreme sensitivity to changes in oxidation reduction (redox) conditions in the landfill (U.S. Navy 2002).
- Levels of arsenic were directly related to background levels in the area and thus cannot be used to indicate the stability of the landfill or give a direct measure of potential landfill impacts to the adjoining marine environment.

The Navy and Ecology outlined a revised strategy for future groundwater monitoring upon the review of these conclusions. This revised strategy is presented in the Final Site 10 Monitoring Plan, Revision 1 (U.S. Navy 2002). It involves continued monitoring only for pH, oxidation-reduction potential, dissolved oxygen, temperature, conductivity, salinity, turbidity, and color in order to evaluate landfill stability and provide an indication of potential impacts to the marine environment.

The Round 15 summary report (U.S. Navy 2004d) concluded that the groundwater quality parameters show no significant changes from historical results. Analysis of dissolved oxygen and redox values measured between Rounds 12 and 15 indicate that natural attenuation may be occurring within the landfill. The Round 15 summary report recommended continued sampling under the Final Site 10 Monitoring Plan, Revision 1, at a frequency of one sampling event per year.

6.4.2 Sediment Monitoring

Two rounds of sediment data have been collected since the first 5-year review, in 2000 and 2004 (U.S. Navy 2001c and 2004h). Similar to the sediment data collected in 1998 (see Section 4.1.3), no concentrations of any chemical exceeded either an SQS or local background value.

During the 2000 monitoring event, zinc and phenol were detected in sediment at concentrations exceeding their respective SQS. However, the maximum detected zinc concentration (3,710 mg/kg) in sediment samples from Site 10 beaches was less than the concentration (5,050 mg/kg) detected in the background sediment sample. The phenol concentration detected at one location (0.46 mg/kg) slightly exceeded its SQS (0.42 mg/kg), but was below its 1.2 mg/kg cleanup screening level (CSL) under the SMS and below the 1.5 mg/kg concentration detected in the 1993 background sediment sample (U.S. Navy 1997c). Phenol was not an identified chemical of concern in any site medium in the ROD. Phenol was detected in shellfish at Site 10; however,

the maximum phenol detection in shellfish (0.26 mg/kg) was more than 1,700 times lower than the risk-based concentration for shellfish (460 mg/kg).

In 2004, the following analyses for sediment were selected based on risk evaluations from the previous sampling events: arsenic, cadmium, chromium, copper, lead, mercury, selenium, silver, zinc, and RDX. All nine metals concentrations exceeded the Samish Bay background levels in at least one sample. However, none of the metals concentrations in the June 2004 sediment samples exceeded the SMS. RDX was not detected.

There were no spatial trends in the 1998, 2000, or 2004 sediment quality data that would indicate that the Site 10 Northend Landfill is a contaminant source to Site 10 beaches. The concentrations observed in 2004 were very similar to those found in 2000. The most significant difference was the maximum zinc concentration in 2004 (63 mg/kg), which was much lower than the maximum zinc concentration in 2000 (3,710 mg/kg).

6.4.3 Human Health Risk Assessments for Shellfish Consumption

As discussed in Section 4.1.3, three risk assessments have been performed using the 1998, 2000, and 2004 shellfish data (U.S. Navy 1999d, 2001b, and 2004f). The 1998 data and the results of the risk assessment conducted on that data were included in the first five-year review. The 1999 risk assessment (U.S. Navy 1999d) found risks due to arsenic in excess of target health goals and also calculated RBCs for shellfish tissue based on safe concentrations for an assumed subsistence consumption scenario. The first 5-year review recommended that shellfish monitoring and evaluation be continued. The two rounds of shellfish monitoring and analysis conducted since the first 5-year review are discussed here.

Using the May 2000 sampling data, an updated HHRA was conducted (U.S. Navy 2001b). The 20 chemicals detected at concentrations greater than those in the background sample were at concentrations below their respective RBCs. Therefore, because no concentrations exceeded an RBC, no health risks were calculated.

Although no chemical concentrations exceeded an RBC in the 2000 data set, an expanded evaluation of regional background arsenic concentrations in Puget Sound shellfish was completed (U.S. Navy 2001c). The objective of this evaluation was to determine whether the estimated risks from eating Site 10 shellfish were at background levels and, thus, whether the monitoring objectives presented in the ROD have been met. The evaluation included a statistical comparison of total arsenic concentrations in Site 10 littleneck clam tissue to those in littleneck clam tissue throughout Puget Sound. The statistical comparison demonstrated that total arsenic concentrations detected in Site 10 shellfish in 1998 and 2000 were at background concentrations

(U.S. Navy 2001c). Therefore, although the estimated cancer risks from eating Site 10 shellfish were above 1×10^{-5} , the estimated risks are attributable to background levels.

Metals were the only constituents detected above background levels at the 10 shellfish sampling stations sampled during the June 2004 event. Eight of the nine metals screened were above the Samish Bay background sample concentrations: cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc. All of the metals that exceeded background levels were screened against the RBCs for shellfish ingestion. All eight metals exceeding background levels were detected at concentrations below their respective RBCs. All background concentrations were also below the RBCs. Therefore, based on the results of the 2004 risk evaluation, the concentrations detected in shellfish were not expected to pose an unacceptable risk to human health.

In addition to the comparison of concentrations to RBCs, the spatial trends of the concentrations of cadmium, lead, and zinc in clam tissue reported for May 1998, May 2000, and June 2004 were evaluated. The results of this evaluation indicated no significant concentration gradients with respect to Site 10. If the Northend Landfill was a primary source of chemicals identified in the ROD, clam tissue concentrations could be expected to show a gradient with the highest concentrations occurring close to the shoreline and concentrations decreasing as distance increased from the landfill. However, the clam tissue concentration patterns are relatively constant across most of the sampling stations, with no apparent spatial gradients. Therefore, it is difficult to determine if the metals detected are attributable to former Site 10 activities, because there appear to be no spatial trends.

Based on this evaluation, the monitoring program goal of demonstrating that exposure to chemicals in shellfish tissue at Site 10 are not expected to cause adverse human health effects has been met with the June 2004 sampling. This conclusion is supported by the results of the 2004 risk evaluation demonstrating that clam tissue concentrations are below risk-based human health criteria established in the ROD for Site 10.

Based on this evaluation, and the fact that Site 10 sediment concentrations are below SQS or background concentrations, it is the Navy's conclusion that the Site 10 shellfish and sediment monitoring requirements of the ROD have been met and that further shellfish and sediment monitoring at Site 10 should no longer be required under the ROD.

6.5 RESULTS OF SITE INSPECTION

The site inspection checklist is included as Appendix A. This section contains a summary of the site inspection findings. The site visit occurred on October 6, 2004, and was conducted by the following personnel:

- Larry Tucker, EFA NW
- Barbara Tissier, Installation Restoration Program, Submarine Base Bangor
- William Rohrer, URS Corporation
- Michael Meyer, URS Corporation
- Sharon Quiring, URS Corporation

The site visit included verifying that remedial actions conducted at Site 36 since the first 5-year review were complete and inspecting all portions of the site covered by institutional controls, specifically Sites 36 and 10.

6.5.1 Completed Remedial Actions

The soil removal at Site 36 was visually inspected during the time of the visit. The site walk verified that this activity had been completed.

6.5.2 Inspection of Institutional Controls

Institutional controls that could be visually inspected were the following:

- Base security procedures still in force (preventing access)
- No observed digging/excavation at Site 36 or on the landfill cap at Site 10
- Shellfish harvesting prohibition signs in place at the affected beaches around Site 10
- Maintenance of nonresidential land use for Sites 10 and 36
- Maintenance of the shoreline stabilization measures at Site 10, specifically, armor revetment to prevent erosion of landfill soils and maintenance of shoreline vegetation

- Maintenance of the landfill cap over the Site 10 landfill (specifically, no settlement, cracks, erosion, bulges, or holes), maintenance of vegetative cover over cap, maintenance of landfill gas vents and drainage system

The site walk verified that the institutional controls listed above appear to be functioning as designed.

6.6 RESULTS OF INTERVIEWS

Interviews were conducted with persons familiar with the CERCLA actions at NAVMAG Indian Island. Interviewees were selected from the Navy, the EPA, Ecology, and the community. Interview instructions and questions were sent to potential interviewees via e-mail, and responses to questions were returned either by e-mail or telephone (at the discretion of the interviewee). Not all those invited to comment chose to do so. Interview responses are documented in Appendix B. Highlights of the interview responses are summarized in the following subsections.

6.6.1 Navy Personnel

Three broad categories of Navy personnel were interviewed: NAVMAG Indian Island personnel, Submarine Base Bangor personnel, and EFA NW personnel. None of those interviewed (two from NAVMAG, one from Bangor, and one from EFA NW) had any concerns regarding the remedy or recommendations for remedy improvement. All considered the remedy to be functioning well, and none of those with public contact was aware of any public concerns.

6.6.2 Agency Personnel

Both Ecology and EPA were invited to comment. EPA responded (see Appendix B) and the interviewee agreed with the Navy personnel above. The remedy appears to be functioning well and there were no recommendations for improvement. Ecology chose not to comment.

6.6.3 Community

Two members of the community were invited to comment, but chose not to do so. The RAB has been disbanded, because there do not appear to be any community concerns regarding Indian Island.

7.0 TECHNICAL ASSESSMENT

7.1 FUNCTIONALITY OF REMEDY

This section answers the question, “Is the remedy functioning as intended by the decision documents?” The functionality of the remedy is discussed here for the three sites where various activities have occurred subsequent to the first 5-year review: Sites 10, 33, and 36. Each component of the remedy is discussed in the sections that follow for these three sites.

The remedies are complete for the remaining five sites, Sites 21, 34, 35, HWSA, and EO101, and no further monitoring or evaluation is required. Concurrence that the remedies at these sites have functioned as intended by the ROD has been received either from Ecology or EPA (under RCRA). Four of these sites, Sites 21, 34, 35, and HWSA, have either been designated an NFA by Ecology, or have received RCRA closure from EPA. All activities for these four locations and the NFA/RCRA closure designations were completed prior to the first 5-year review. Therefore, their remedies functioned as designed, and they are not discussed further in this section. A fifth location, Site EO101, was investigated in the spring of 2004, and no hazardous materials were discovered. Because the site received an NFA without any remedial activities occurring, this site is not discussed in this section.

7.1.1 Functionality of the Remedy for Site 10

The remedy for Site 10 is functioning as intended. Continued effectiveness requires ongoing inspection and maintenance of the cap and the shoreline stabilization to address issues similar to those that have occurred over the last 10 years (some stressed vegetation, invasive weeds, and extension of the revetment). The appropriate programs and activities are in place and are fulfilling inspection and maintenance requirements. The required land use controls have been formalized in an ICMP (U.S. Navy 2001d). The site inspection reports reviewed as part of this 5-year review indicate that the required land use controls have been maintained since signing the ROD, and that the institutional controls component of the remedy is functional.

Groundwater monitoring has been occurring as specified in the ROD. Monitoring results from the first eight rounds of groundwater monitoring indicate that no chemicals in site groundwater were exceeding either RGs or regional background concentrations. Therefore, chemical analysis of groundwater was discontinued, and subsequent groundwater monitoring focused on geochemical parameters as indicators of landfill stability. The results of the last four rounds of sampling show no significant changes in geochemical parameters and indicate that natural attenuation may be occurring within the landfill. These results demonstrate that there have been

no significant changes in landfill stability that might impact the mobilization of COCs within the landfill.

Marine monitoring has been occurring as specified in the ROD. Based on the results of the 2004 risk evaluation, the concentrations of COCs detected in shellfish were not expected to pose an unacceptable risk to human health. In addition, site concentrations of COCs were not different from background concentrations in shellfish collected from Samish Bay. Therefore, with the June 2004 sampling and risk evaluation analysis, the Navy has met the monitoring program goal of demonstrating that exposure to chemical concentrations in shellfish tissue at Site 10 are not expected to cause adverse human health effects. In addition, the fact that Site 10 sediment concentrations are below SQS or background concentrations further supports the conclusion that there is no longer any unacceptable risk to humans or the environment occurring at the beaches around Boggy Spit.

7.1.2 Functionality of the Remedy for Site 33

The remedy functioned as intended for Site 33. As described in Section 4.3.1, all impacted materials were removed from this location, and no institutional controls are required. Therefore, the remedy is complete, with no restrictions on land use. The site received an NFA designation from Ecology in 2001.

7.1.3 Functionality of the Remedy for Site 36

The remedy functioned as intended for Site 36. All cPAH-impacted soils with concentrations above MTCA unrestricted soil cleanup levels were removed. Therefore, institutional controls are no longer required at this location. The site received an NFA designation from Ecology in 2001, and the Navy is pursuing an amendment to the ICMP to remove any institutional control requirements from Site 36.

7.1.4 Operation and Maintenance Costs for Site 10

The review of predicted versus actual O&M costs is a tool to assist in the evaluation of the remedies selected for the site. Significantly higher costs than those predicted at the time of the ROD can indicate potential problems with the remedy.

Through the first 3 years of OM&M at Site 10 (June 1997 through fall 2000), actual costs were \$1,016,600. For fiscal year 2001 (starting in October 2000), costs were \$73,771. For fiscal years 2002 and 2003, combined costs were \$35,942. For fiscal year 2004 and the first half of 2005, the combined costs were \$93,087. In addition to these regular OM&M costs, an additional

\$220,676 was spent in fiscal year 2003 for the major maintenance discussed in Section 4.1.3 (extending the rock revetment farther west).

The ROD estimate for the selected remedy yearly OM&M cost was \$81,200. The actual mean OM&M cost (exclusive of the major maintenance in 2003) was \$162,586, a 100 percent increase over the ROD estimate. However, the trend is lower OM&M annual costs over time. The higher actual costs reflect the more rigorous inspection and maintenance activities required, compared to those anticipated at the time of the ROD. The anchored log system, in particular, required significantly more maintenance than expected, eventually resulting in the additional \$220,676 expenditure to extend the rock revetment into the anchored log area.

7.2 CONTINUED VALIDITY OF ROD ASSUMPTIONS

This section answers the question, “Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?” Therefore, this section reviews any changes to ARARs used to establish remediation goals (RGs) in the ROD and reviews any changes to risk assessment assumptions (exposure and toxicity) to evaluate the protectiveness of the remedy.

7.2.1 Review of Applicable or Relevant and Appropriate Requirements

In the preamble to the NCP, EPA stated that ARARs are generally “frozen” at the time of ROD signature, unless new or modified requirements call into question the protectiveness of the selected remedy. Five-year review guidance (USEPA 2001a) indicates that the question of interest in developing the 5-year review is not whether a standard identified as an ARAR in the ROD has changed in the intervening period, but whether this change to a regulation calls into question the protectiveness of the remedy. If the change in the standard would be more stringent, the next stage is to evaluate and compare the old standard and the new standard and their associated risk. This comparison is done to assess whether the currently calculated risk associated with the standard identified in the ROD is still within EPA’s acceptable excess cancer risk range of 10^{-4} to 10^{-6} . If the old standard is not considered protective, a new cleanup standard may need to be adopted after the 5-year review through CERCLA processes for modifying a remedy.

During the first 5-year review for Indian Island, no substantive changes were found to ARARs that would call into question the protectiveness of the remedy. For this 5-year review, all the ARARs identified in the ROD were again reviewed for changes that could affect the assessment of whether the remedy is protective. Only ARARs affecting whether the remedy for Site 10 is

protective were reviewed for changes that could affect the protectiveness assessment. Site 21 was not assessed because of the NFA determination.

The ROD did not list specific numeric RGs for Site 10, but only stated that applicable ARARs would be complied with. For Site 10, groundwater and sediment were to meet ARARs protective of the marine environment, and shellfish were to meet target health goals for subsistence harvesters of 1×10^{-5} for cancer-causing chemicals and a hazard quotient of 1 for non-cancer-causing chemicals, or site tissue concentrations were to equal background tissue concentrations. Since the ROD, long-term monitoring results for Site 10 groundwater have been compared to surface water standards (MTCA Method B surface water cleanup standards are taken directly from WAC 173-201A), and Site 10 sediment samples have been compared to Washington State's SMS. All comparisons used the latest version of the applicable ARARs, so there are not changes to ARARs that affect the protectiveness of the remedy. For Site 10 shellfish data, risk assessments were conducted for each round of tissue sampling and concentration results were compared to background tissue concentrations. Risk assessment assumptions are discussed further below.

7.2.2 Review of Risk Assessment Assumptions

An important part of the remedy for this site is the prevention of adverse human health effects from ingestion of shellfish collected in Port Townsend Bay and Kilisut Harbor. Currently, shellfish harvesting is restricted. Restrictions are based on the finding of the original risk assessment conducted as part of the RI, and on the first of the post-ROD shellfish risk assessments. The original risk assessment found that chemicals in shellfish could present health risks in excess of target health goals if the shellfish were consumed at a subsistence level. The exposure parameters used in the baseline risk assessment for subsistence harvesters were a combination of EPA default parameters and parameters obtained from peer-reviewed literature. None of these values has changed.

Potential changes in the shellfish ingestion rate for subsistence harvesters would not affect the protectiveness of the remedy, because concentrations of the COCs in shellfish are the same as concentrations in shellfish from the reference area, i.e., concentrations are at background and are not being influenced by chemicals from the Site 10 landfill.

7.3 NEW INFORMATION

This section is in response to the question "Has any other information come to light that could call into question the protectiveness of the remedy?" No other information reviewed during this

5-year review, apart from what is included previously in this document, affects the protectiveness of the remedy.

7.4 TECHNICAL ASSESSMENT SUMMARY

The remedies are functioning as designed, and progress towards meeting RAOs has been made since the completion of the remedy. The following summarizes the assessment:

- Erosion of landfill soil and contents into Port Townsend Bay and Kilisut Harbor is being prevented by the shoreline stabilization work that occurred as part of the remedy.
- There are mechanisms in place to ensure that the shoreline stabilization system is inspected and properly maintained.
- The landfill cap over areas containing concentrations above ARARs is being maintained, and the cap is being regularly inspected and maintained according to the ICMP.
- The RAOs established for sediment and shellfish tissue have been met.
- Institutional controls for Site 36 are no longer necessary, because the affected soil has been removed.

8.0 RECOMMENDATIONS AND FOLLOWUP ACTIONS

Recommendations or follow-up actions identified as a result of the 5-year review process are the following:

- Continue the institutional controls program activities for Site 10 (includes all activities related to shoreline stabilization and the landfill cap).
- Continue Site 10 groundwater monitoring at a frequency of twice per year, to continue to evaluate the stability of landfill conditions and ensure that COCs are not being mobilized.
- Discontinue shellfish and sediment monitoring. The Site 10 shellfish and sediment monitoring requirements of the ROD have been met, the RAOs have been met and, therefore, further shellfish and sediment monitoring at Site 10 is not required.
- Discontinue shellfish harvest restrictions based on chemical concentrations (beach access restrictions remain in place for safety considerations, because of ordnance handling operations). When the explosives safety restriction is retracted from the Site 10 area, and there is a request to harvest the Site 10 beaches, the Navy will contact Washington's Department of Health regarding reopening the beaches for shellfish harvesting.
- Discontinue the institutional controls associated with Site 36 and amend the ICMP accordingly.

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9.0 CERTIFICATION OF PROTECTIVENESS

The remedies implemented for NAVMAG Indian Island continue to be protective of human health and the environment.

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10.0 NEXT REVIEW

The next 5-year review is tentatively scheduled for 2010.

11.0 REFERENCES

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APPENDIX A

Site Inspection Checklist

I. SITE INFORMATION	
Site name: <i>Naval Magazine, Indian Island</i>	Date of inspection: 09/15/04
Location and Region: <i>Port Hadlock, WA, Region 10</i>	EPA ID: 110001855662
Agency, office, or company leading the five-year review: <i>US Navy, URS Corporation</i>	Weather/temperature: <i>partly sunny, mid-50° 's F</i>
Remedy Includes: (Check all that apply) <input checked="" type="checkbox"/> Landfill cover/containment G Monitored natural attenuation <input checked="" type="checkbox"/> Access controls G Groundwater containment <input checked="" type="checkbox"/> Institutional controls G Vertical barrier walls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other: <i>Shoreline erosion protection, monitoring of groundwater, sediment, and shellfish</i>	
Attachments: G Inspection team roster attached G Site map attached	
II. INTERVIEWS (Check all that apply)	
1. Navy Staff Contact: (b) (6) Problems; suggestions; <input checked="" type="checkbox"/> Report attached Contact: <i>Bill Kalina</i> Problems; suggestions; <input checked="" type="checkbox"/> Report attached Contact : <i>Barb Tissier</i> Problems; suggestions; <input checked="" type="checkbox"/> Report attached Contact : <i>Larry Tucker</i> Problems; suggestions; <input checked="" type="checkbox"/> Report attached	
2. Regulatory and Tribal authorities and response agencies Agency: <i>Ecology</i> Contact : <i>Ben Forson</i> Problems; suggestions; <input type="checkbox"/> Report attached: <i>Did not choose to respond</i> Agency : <i>EPA</i> Contact: <i>Bob Kievit</i> Problems; suggestions; <input checked="" type="checkbox"/> Report attached	

3.	Members of the public Contact: <i>Ann Murphy</i> Problems; suggestions; G Report attached: <i>Did not choose to respond</i> Contact: <i>Bob Vanettan</i> Problems; suggestions; G Report attached: <i>Did not choose to respond</i>																																											
4.	Other interviews (optional) G Report attached.																																											
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)																																												
1.	O&M Records <table style="width: 100%; border: none;"> <tr> <td style="width: 45%;">G O&M manual</td> <td style="width: 20%;">G Readily available</td> <td style="width: 20%;">G Up to date</td> <td style="width: 15%;">G N/A</td> </tr> <tr> <td>G As-built drawings</td> <td>G Readily available</td> <td>G Up to date</td> <td>G N/A</td> </tr> <tr> <td>G Maintenance logs</td> <td>G Readily available</td> <td>G Up to date</td> <td>G N/A</td> </tr> </table> Remarks: <i>No on-site facility manual retained by EFA NW</i>				G O&M manual	G Readily available	G Up to date	G N/A	G As-built drawings	G Readily available	G Up to date	G N/A	G Maintenance logs	G Readily available	G Up to date	G N/A																												
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G As-built drawings	G Readily available	G Up to date	G N/A																																									
G Maintenance logs	G Readily available	G Up to date	G N/A																																									
2.	Institutional Controls Inspection Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date Remarks: _____																																											
IV. O&M COSTS																																												
1.	O&M Organization <table style="width: 100%; border: none;"> <tr> <td style="width: 40%;">G State in-house</td> <td style="width: 60%;">G Contractor for State</td> </tr> <tr> <td>G PRP in-house</td> <td>G Contractor for PRP</td> </tr> <tr> <td>G Federal Facility in-house</td> <td><input checked="" type="checkbox"/> Contractor for Federal Facility</td> </tr> <tr> <td colspan="2">G Other _____</td> </tr> </table>				G State in-house	G Contractor for State	G PRP in-house	G Contractor for PRP	G Federal Facility in-house	<input checked="" type="checkbox"/> Contractor for Federal Facility	G Other _____																																	
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G Federal Facility in-house	<input checked="" type="checkbox"/> Contractor for Federal Facility																																											
G Other _____																																												
2.	O&M Cost Records <input checked="" type="checkbox"/> Readily available G Up to date G Funding mechanism/agreement in place Original O&M cost estimate: <i>\$81,200 annually</i> Total annual cost by year for review period if available: <i>Annual average has been \$162,586 (see text)</i> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 20%;">To _____</td> <td style="width: 20%;">_____</td> <td style="width: 40%;">G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td>_____</td> <td>G Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> </table>				From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost		From _____	To _____	_____	G Breakdown attached	Date	Date	Total cost	
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3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: <i>See text. Higher costs reflect more rigorous inspection and maintenance activities. Costs are decreasing over time.</i>																																											

V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. General Facility	
1.	Base security procedures still in force? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Remarks: <i>Controlled gate, badges required</i>
B. Site 10	
1.	Any activities disruptive to landfill cap or shoreline protection? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Remarks: _____
2.	Any residential or farming land use on landfill? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Remarks: _____
3.	Any digging or construction activities without dig permit? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Remarks: <i>None observed</i>
4.	Any shellfish harvesting apparent on Beaches 1, 2, or 19? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Remarks: <i>None observed</i>
5.	Shellfish harvest restriction signs intact and legible? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Remarks: _____
C. Site 36	
1.	Any water wells installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Remarks: _____
2.	Any residential or farming land use on landfill? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Remarks: _____

D. Overall Institutional Controls	
1.	Implementation and enforcement Site conditions imply ICs properly implemented <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Site conditions imply ICs being fully enforced <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Type of monitoring (<i>e.g.</i> , self-reporting, drive by): <i>Self-reporting</i> Frequency: <i>Annually</i> Responsible party: <i>Navy</i> Contact: <i>Barb Tissier</i> Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Specific requirements in decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Other problems or suggestions: <input type="checkbox"/> Report attached

2.	Adequacy Remarks _____	<input checked="" type="checkbox"/> ICs are adequate	G ICs are inadequate	G N/A
VI. REMEDY COMPONENTS (GENERAL VISUAL INSPECTION)				
A. Perimeter Road (Site 10) <input checked="" type="checkbox"/> Applicable G N/A				
1.	Roads damaged Remarks _____	G Location shown on site map	<input checked="" type="checkbox"/> Roads adequate	G N/A
B. Landfill Cap and Shoreline Protection (Site 10)				
1.	Settlement (Low spots) Areal extent _____ Remarks _____	G Location shown on site map Depth _____	<input checked="" type="checkbox"/> Settlement not evident	
2.	Cracks Lengths _____ Remarks _____	Widths _____ Depths _____	<input checked="" type="checkbox"/> Cracking not evident	
3.	Erosion Areal extent _____ Remarks _____	G Location shown on site map Depth _____	<input checked="" type="checkbox"/> Erosion not evident	
4.	Holes Areal extent _____ Remarks _____	G Location shown on site map Depth _____	<input checked="" type="checkbox"/> Holes not evident	
5.	Vegetative Cover G Trees/Shrubs (indicate size and locations on a diagram) Remarks _____	<input checked="" type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established	<input checked="" type="checkbox"/> No signs of stress	
6.	Irrigation System Remarks: <i>Plant re-population planned. No mowing. Mowing may need to be done to help with weeding.</i>	<input checked="" type="checkbox"/> Not Functional	G Functional	G Damaged
7.	Bulges Areal extent _____ Remarks _____	G Location shown on site map Height _____	<input checked="" type="checkbox"/> Bulges not evident	
8.	Wet Areas/Water Damage G Wet areas G Ponding G Seeps G Soft subgrade Remarks _____	<input checked="" type="checkbox"/> Wet areas/water damage not evident G Location shown on site map G Location shown on site map G Location shown on site map G Location shown on site map	Areal extent _____ Areal extent _____ Areal extent _____ Areal extent _____	

9.	Slope Instability	G Slides	G Location shown on site map	<input checked="" type="checkbox"/> No evidence of slope instability
Areal extent _____				
Remarks _____				
10.	Gas Vents	G Active <input checked="" type="checkbox"/> Passive	<input checked="" type="checkbox"/> Properly secured/locked	<input checked="" type="checkbox"/> Functioning
		<input checked="" type="checkbox"/> Evidence of leakage at penetration	<input checked="" type="checkbox"/> Routinely sampled	<input checked="" type="checkbox"/> Good condition
		G N/A	G Needs Maintenance	
Remarks _____				
11.	Monitoring Wells (within surface area of landfill)	<input checked="" type="checkbox"/> Properly secured/locked	<input checked="" type="checkbox"/> Functioning	<input checked="" type="checkbox"/> Routinely sampled
		<input checked="" type="checkbox"/> Evidence of leakage at penetration	<input checked="" type="checkbox"/> Needs Maintenance	<input checked="" type="checkbox"/> Good condition
			G N/A	
Remarks _____				
C. Landfill Cover Drainage Layer (Site 10)		<input checked="" type="checkbox"/> Applicable	G N/A	
1.	Outlet Pipes Inspected	<input checked="" type="checkbox"/> Functioning	G N/A	
Remarks: <i>Regularly inspected</i>				
2.	Outlet Rock Inspected	<input checked="" type="checkbox"/> Functioning	G N/A	
Remarks: <i>Regularly inspected</i>				
D. Surface Water Structures at Landfill (Site 10)				
1.	Siltation	G Location shown on site map	<input checked="" type="checkbox"/> Siltation not evident	
		Areal extent _____	Depth _____	
Remarks _____				
2.	Vegetative Growth	G Location shown on site map	G N/A	
		<input checked="" type="checkbox"/> Vegetation does not impede flow		
		Areal extent _____	Type _____	
Remarks _____				
3.	Erosion	G Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident	
		Areal extent _____	Depth _____	
Remarks _____				
4.	Discharge Structure	G Functioning	G N/A	
Remarks: <i>Did not inspect</i>				
E. Log Revetment/Anchor System (Site 10)				
1.	Overall Condition	G Good	G Some work needed	G Poor
		Condition of logs	G Good	G Some work needed
		Condition of anchor/chain assembly	G Good	G Some work needed
		Condition of beach	<input checked="" type="checkbox"/> Good	G Some work needed
			G Poor	G Poor
Remarks: <i>Removed logs and anchor chain system and replaced with rock. No erosion seen</i>				
F. Groundwater, Sediment, and Shellfish Monitoring				

1.	Monitoring Wells G Properly secured/locked G Functioning G Routinely sampled G Good condition G All required wells located G Needs Maintenance G N/A Remarks: <i>O.K. based on reporting</i>
2.	Monitoring Types of monitoring being conducted: <input checked="" type="checkbox"/> Groundwater <input checked="" type="checkbox"/> Sediment <input checked="" type="checkbox"/> Shellfish Frequency: <i>See text</i>
3.	Data Trends Describe results and trends: <i>See text</i>
VII. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <i>Remedy is functioning as designed (see text).</i>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <i>O&M is functioning well (see text).</i>	

APPENDIX B

Interview Responses

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Type 2 Interview – Regulatory/Advisory Agency

Naval Magazine Indian Island

Washington

Individual Contacted: (b) (6)

Title: Former Navy IR Coordinator

Organization: Navy

Telephone: (b) (6) 5

E-mail: (b) (6)

Address Tacoma, Wash. 98466

Contact made by: Heather Boge

Response type: E-mail

Date: 10/27/04

Summary of Communication

1. To the best of your knowledge, since September 2000 have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies? Have there been any changes to the ARARs upon which the remedy decision was based?

Response: The shoreline at Site 10 southwest of the hard bank protection has eroded and metal debris has been found. The hard bank has been extended southwest about 55 feet and is working good at the current time. NO.

2. Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedy selected in the ROD?

Response: No

3. Since September 2000, have there been any complaints, violations, or other incidents related to NAVMAG Indian Island that required a response by your office? If so, please provide details of the events and results of the responses.

Response: No

4. Are you aware of any community concerns regarding implementation of the remedies at NAVMAG Indian Island? If so, please give details.

Response: No

5. Do you have any suggestions for changes to how the selected remedies (including institutional controls) are implemented?

Response: NavMag Indian Island needs to put road maintenance in the operational budget for Site 10.

6. Do you have any suggestions for changes to how monitoring of the remedy is conducted?

Response: No

7. Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at NAVMAG Indian Island?

Response: No

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Type 1 Interview – Navy Personnel

Naval Magazine Indian Island

Washington

Individual Contacted: Bill Kalina

Title: Biologist

Organization: NAVMAG

Telephone: 360-396-5353

E-mail: kalina.william@bangor.navy.mil

Address:

Contact made by: Heather Boge

Response type: E-mail

Date: 11/09/04

Summary of Communication

1. Since completion of the first 5-year review in September 2000, are you aware of any changes in land uses, access, or other site conditions that you feel may impact the protectiveness of the remedy selected in the ROD?

Response: No

2. Are you aware of concerns from the local community regarding implementation or overall environmental protectiveness of the selected remedy?

Response: Through the Jefferson County MRC I have read reports floating around the county that the Indian Island Site 10 Landfill is still an active contamination source for Port Townsend Bay water quality. Such reports have been authored without current information on the landfill cap remedy.

3. Has there continued to be a regular on-site inspection and operation, maintenance, and monitoring (OMM) presence since September 2000?

Response: Yes.

4. Have there been any unexpected OMM difficulties since September 2000?

Response: Additional armor rock was required where beach erosion was occurring near the anchored drift logs.

5. Have there been any substantial changes to inspection and OMM requirements or activities? If so, do you feel that these changes have impacted the protectiveness of the remedy selected in the ROD?

Response: No

6. Are you aware of any violations of the institutional controls requirements at any of the OUs that could impact the protectiveness of this component of the remedy (e.g., unauthorized excavation, unauthorized use of groundwater)?

Response: No

7. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NAVMAG, Indian Island?

Response: All the remedies seem to be functioning properly at this time.

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Type 1 Interview – Navy Personnel

Naval Magazine Indian Island

Washington

Individual Contacted: Barbara Tissier

Title: Bangor IR Program Coordinator

Organization: Navy

Telephone: 360-396-5094

E-mail: barbara.chafin@navy.mil

Address:

Contact made by: Heather Boge

Response type: E-mail

Date: 11/1/04

Summary of Communication

1. Since completion of the first 5-year review in September 2000, are you aware of any changes in land uses, access, or other site conditions that you feel may impact the protectiveness of the remedy selected in the ROD?

Response: No

2. Are you aware of concerns from the local community regarding implementation or overall environmental protectiveness of the selected remedy?

Response: No

3. Has there continued to be a regular on-site inspection and operation, maintenance, and monitoring (OMM) presence since September 2000?

Response: Yes, as required.

4. Have there been any unexpected OMM difficulties since September 2000?

Response: There have been some shoreline issues, which were corrected. The shoreline protection anchored logs were being displaced by heavy surf and winds. They were replaced several times, and most recently were taken out and replaced with armor rock.

5. Have there been any substantial changes to inspection and OMM requirements or activities? If so, do you feel that these changes have impacted the protectiveness of the remedy selected in the ROD?

Response: No.

6. Are you aware of any violations of the institutional controls requirements at any of the OUs that could impact the protectiveness of this component of the remedy (e.g., unauthorized excavation, unauthorized use of groundwater)?

Response: No, I have done the inspections for the last 2 years.

7. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NAVMAG, Indian Island?

Response: I believe the Navy and RPM have done a quality job in ensuring that the remedies are protective of human health and the environment. Since I came on board with the IR Program in May of 03 I have observed the projects to improve the shoreline and the O&M inspections and monitoring. They have been done according to all requirements.

INTERVIEW RECORD FOR SECOND FIVE-YEAR REVIEW

September 2000 through September 2005

Type 1 Interview – Navy Personnel

Naval Magazine Indian Island

Washington

Individual Contacted: Larry Tucker

Title: Regional Project Manager

Organization: EFA NW

Telephone: 360-396-0053

E-mail: larry.tucker@navy.mil

Address: 19917 7th AV NE
Poulsbo, WA 08370

Contact made by: Heather Boge

Response type: E-mail

Date: 10/25/04

Summary of Communication

1. Since completion of the first 5-year review in September 2000, are you aware of any changes in land uses, access, or other site conditions that you feel may impact the protectiveness of the remedy selected in the ROD?

Response: None

2. Are you aware of concerns from the local community regarding implementation or overall environmental protectiveness of the selected remedy?

Response: I am not aware of any community concerns regarding the protectiveness of the remedy.

3. Has there continued to be a regular on-site inspection and operation, maintenance, and monitoring (OMM) presence since September 2000?

Response: Inspection and maintenance is completed per a Maintenance Plan – and is completed yearly. Groundwater monitoring occurs twice per year – per a Monitoring Plan and shellfish and sediment were sampled and analyzed in June 2004.

4. Have there been any unexpected OMM difficulties since September 2000?

Response: Approximately 60 feet of shoreline was repaired in 2003 to replace the “soft-beach” that was comprised of anchored logs. The repairs included

removal of beach material and replacement with riprap similar to that existing on the shoreline protection system.

5. Have there been any substantial changes to inspection and OMM requirements or activities? If so, do you feel that these changes have impacted the protectiveness of the remedy selected in the ROD?

Response: None

6. Are you aware of any violations of the institutional controls requirements at any of the OUs that could impact the protectiveness of this component of the remedy (e.g., unauthorized excavation, unauthorized use of groundwater)?

Response: None

7. Do you have any overall comments, concerns, or suggestions regarding the effectiveness of the remedies in protecting human health and the environment at NAVMAG, Indian Island?

Response: The landfill cap and shoreline protection system are working effectively and are providing the necessary protection to the environment.